Vol. VII.—No. 33.] [DECEMBER, 1886.

THE

MINERALOGICAL MAGAZINE

AND

JOURNAL

OF THE

Mineralogical Society.

INSTITUTED 3rd FEBRUARY, 1876.

EDITED BY A COMMITTEE OF COUNCIL.

Reprinted 1964 for Wm. Dawson & Sons Ltd., London
with the permission of
THE MINERALOGICAL SOCIETY

Mineralogical Society.

OFFICERS FOR 1885-86.

PRESIDENT.

L. FLETCHER, M.A., F.G.S.

PAST-PRESIDENTS.

H. C. SORBY, LL.D., F.R.S., &c. &c.

PROF. M. FORSTER HEDDLE, M.D., F.R.S.E.

VICE-PRESIDENTS.

THE REV. PROFESSOR HAUGHTON, M.D., F.R.S., &c. &c.

W. H. HUDLESTON, J.P., M.A., F.R.S., &c. &c.

COUNCIL.

T. W. DANBY, M.A., F.G.S.
J. J. DOBBIE, D.Sc.
PROF. W. J. LEWIS, M.A.
C. A. BURGHARDT, LL.D.
A. GEIKIE, LL.D., F.R.S.
REV. H. GURNEY, M.A.
HUGO MÜLLER, Ph.D., F.R.S.
REV. W. W. PEYTON.
PROF. J. W. JUDD, F.R.S.
PROF. E. KINCH, F.C.S.
PROF. W. IVISON MACADAM, F.C.S.
J. H. TEALL, F.G.S.

TRUSTEES.

THE RIGHT HON. LORD DE BLAQUIÈRE, F.R.G.S.

PATRICK DUDGEON, F.R.S.E.

TREASURER.

THE REV. PROFESSOR T. G. BONNEY, M.A., D.Sc., F.R.S.

GENERAL SECRETARY, *pro tem.*

R. H. SCOTT, M.A., F.R.S.

FOREIGN SECRETARY.

T. DAVIES, F.G.S.

LOCAL SECRETARY.

Central Scotland—REV. W. W. PEYTON.

AUDITORS.

B. KITTO, F.G.S.

F. W. RUDLER, F.G.S.

Jahrbuch der K. K. Geologischen Reichsanstalt, Band XXXVI., Heft. I.; and Verhandlungen der K. K. Geolog. Reichsanstalt, Nos. 16 to 18, 1885, and Nos. 1 to 7, 1886. Presented by the Institute.

Mineralogische und petrographische Mittheilungen. Herausgegeben von G. Tschermak. Neue Folge, Band VII. Hefte IV. and V. Presented by the Editor.

Annales de la Société Géologique de Belgique. Tome douzième. Presented by the Society.

Bollettino del R. Comitato Geologica d' Italia. Nos. 11 and 12, 1885, and Nos. 1 to 4, 1886. Presented by the Survey.

Atti della Società Toscana di Scienze Naturali, Memorie, Vol. VII.; Processi Verbali, Vol. V. Presented by the Society.

Annales de la Sociedad Cientifica Argentina. Tomo XXI., Parts 1 and 2; and Examen de la Propuesta y Proyecto del Puerto del Sr. D. Eduardo Madero. Por Luis A. Huergo. Parts 1 and 2; Buenos Ayres, 1886.
Presented by the Scientific Society of the Argentine Republic.

EXCERPT MINUTES OF COUNCIL MEETING

Held at the Museum, Jermyn Street, June 22nd, 1886.

The following Member was elected—

ANDREW TAYLOR, F.C.S., 11 Lutton Place, Edinburgh.

EXCERPT MINUTES OF COUNCIL MEETING

Held at the Museum, Jermyn Street, October 26th, 1886.

The Draft Report for the year 1885-6 was adopted for submission to the Society.

The following days were fixed for the Meetings of the Society during the coming session:—

January 11th, 1887.
May 10th, 1887,
October 25th, 1887, Anniversary.
The date of the Scotch Meeting to be announced hereafter.

GENERAL MEETING.

Held at the Museum, Jermyn Street, June 22nd, 1886.

L. FLETCHER, M.A., F.G.S., President, in the Chair.

The following papers were read:—

"On Barytes from Addiewell, West Calder, N.B." By C. O. Trechmann, Ph.D. (p. 49.)

"On Plattnerite." By Prof. E. Kinch, F.I.C. (p. 63.)

"On Dufrenite." By F. H. Butler, M.A., A.R.S.M. (p. 65.)

"On Apatite from Cornwall." By R. H. Solly, F.G.S. (p. 57.)

"On Anglesite from Portugal." By R. H. Solly, F.G.S. (p. 61.) Mr Semmons remarked, that in the large heaps of pyrites from the San Domingo Mine which he had seen near Liverpool, he had noticed small strings of Galena from $\frac{1}{16}$th to $\frac{1}{4}$ inch wide. The crystals of Anglesite which had been frequently met with in this pyrites, were generally very small and of a light yellow colour, sometimes being quite transparent. He congratulated Mr. Solly on the fine crystal exhibited, it being, compared with those he had seen, as a leviathian among pigmies. It might be of interest to remark that one of these pyrites heaps which had been exposed for some years at Garston in the open air had, by the formation of copper and lime sulphates, become as hard as mortar, so that explosives had to be used to break it up.

Mr. Rudler exhibited some specimens of "Anglesite" from the Ludlam Collection, illustrative of Mr. Solly's paper.

Mr. Semmons exhibited some crystals of Aragonite from Colorado and the Indian Territory. The interest of the specimens was increased b

heir almost precise similarity of appearance though raised from localities t least 300 miles apart. The crystals showed the close relations that xist between the lead and lime carbonates.

Mr. Simpson (visitor) exhibited a very large crystal of blue topaz, rolled, ound in a tin drift in Tasmania.

Mr. C. J. Woodward, F.G.S., exhibited a semicircular protractor for use n class lectures.

The President exhibited specimens of crystallised "Colemanite;" rystallised "Argyrodite," containing the new metal "Germanium;" Polysynthetic "Calcite."

ANNIVERSARY MEETING.

Held at the Museum, Jermyn Street, October 26th, 1886.

L. Fletcher, M.A., F.G.S., President, in the Chair.

The following Report of Council was read and adopted:—

The Balance Sheet of the Society for the year 1884-5, which appeared in No. 32 of the Journal, showed that the finances of the Society continue in a satisfactory condition. The excess of Assets over Liabilities amounted to £241 4s. 3d., being an increase of £25 11s. 11d. during the year.

The number of members elected since the last Anniversary has been ten, while the resignations have been twelve in number. In addition, four names have been removed from the list for non-payment of subscriptions during three years. The Council have to notice with extreme regret that among the resignations, owing to continued ill health, the name of Mr. R. P. Greg, their former Treasurer, appears. It will be remembered that Mr. Greg was joint author (with Mr. W. G. Lettsom) of the "Manual of British Mineralogy," which still remains our best authority for British Mineral Species.

Three Meetings have taken place since the last Anniversary. Those in December 1885 and June 1886 were held in the Museum of Economic Geology, by kind permission of the Director-General of the Geological Survey.

The third was held at St. Andrew's, in May 1886, and was equally successful with the Scotch Meetings of the previous two years.

Two Parts of the Journal have appeared during the year, and the Council have again to remind the Society that the number of

members who contribute to its Proceedings is very limited. It is only by the active co-operation of the members that the value of the Journal as a scientific publication can be maintained.

Messrs. Miers and Solly were appointed Scrutineers, and reported that the following had been elected Officers and Council for the ensuing year:—

President.	L. Fletcher, M.A., F.G.S.
Vice-Presidents.	Rev. S. Haughton, M.D., F.R.S.
	W. H. Hudleston, M.A., F.R.S.
Council.	Prof. J. W. Judd, F.R.S.
	Prof. E. Kinch, F.I.C., F.C.S.
	Prof. W. Ivison Macadam, F.I.C., F.C.S.
	J. H. Teall, F.G.S.
Treasurer.	Rev. Professor T. G. Bonney, D.Sc., F.R.S.
General Secretary.	R. H. Scott, M.A., F.R.S.
Foreign Secretary.	T. Davies, F.G.S.
Auditors.	B. Kitto, F.G.S.
	F. W. Rudler, F.G.S.

On the motion of Mr. Davies, seconded by Mr. Scott, it was resolved "That the thanks of the Society be voted to Dr. A. Geikie for his kind permission to use the Theatre for its meetings."

The following papers were then read :—

"On the Cassiterite of the Straits Settlements." By J. H. Hampton. (p. 71.)

"On the Analysis of a Sample of Talc used in Paper making." By Prof. W. I. Macadam, F.I.C., F.C.S. (p. 75.)

"On the Analyses of Cornish China Clays (Kaolinite)." (p. 76.)

"On the Occurrence of considerable Deposits of Limonite in North-west Ross-shire." (p. 72.)

"Further Note on Agalmatolite in Gairloch Parish, Ross-shire." (p. 74.)

"Short List of Minerals obtained in Gairloch Parish, North-west Ross-shire." (p. 73.)

Professor Macadam also submitted a provisional list of minerals occurring in Gairloch Parish, Ross-shire.

"Note on the identification of the Scotch and New Brunswick Albertite." By Rev. Dr. Honeyman (communicated by Prof. Macadam). (p. 77.)

"On the relation between the Solution Planes of Crystals and those of Secondary Twinning, and on the Mode of Development of Negative Crystals along the former." By Prof. J. W. Judd, F.R.S. (p. 81.)

"On certain Schorlaceous Rocks from near St. Austell." By F. H. Butler, M.A., A.R.S.M. (p. 79.)

Dr. Victor Goldschmidt exhibited some of the plates of a crystallographical atlas which he is publishing.

EXCERPT MINUTES OF COUNCIL MEETING

Held at 116 *Victoria Street, June* 25*th*, 1885.

The Rev. Prof. Bonney, D.Sc., President, in the Chair.

Messrs. F. H. Butler and H. Robinson were elected members.

GENERAL MEETING

Held at the Rooms of the Philosophical Society, 207 *Bath Street, Glasgow, Tuesday, June* 16*th*, 1885.

Mr. John Young, F.G.S., of the Hunterian Museum, Glasgow (Visitor), in the Chair.

Mr. G. S. Mackenzie, Ph.D., read a paper—"On an Occurrence of rare Copper Minerals from Utah." (p. 181.)

Mr. D. C. Glen, F.G.S. (Visitor) exhibited a series of mineral specimens from the district round Glasgow, and from one or two other localities within the area of the Estuary of the Clyde, upon which he and the Chairman made some remarks. The specimens consisted of examples of the group of Zeolitic minerals that are found in the basic olivine traps of the Kilpatrick and Renfrewshire hills, and embraced crystallised varieties of Prehnite, analcite, Laumontite, natrolite, Thomsonite, stilbite, Heulandite, Chabasite, &c. Mr. Glen also exhibited specimens of native copper from the trap of Boyleston Quarry, Barrhead, and some crystals of the rare mineral Greenockite from the trap of the Bishopton Tunnel, also specimens of the Arran pitchstones, and spherulites, from Corriegills and Invercloy.

The Local Secretary read the following paper:—

"On Monazite and Connellite from Cornwall." By H. A. Miers, M.A. (p. 164.)

The Chairman, Mr. John Young, F.G.S., exhibited a series of specimens and polished transparent sections of "Cone-in-Cone" structures from the carboniferous strata of Western Scotland, and stated that recently he had been led to make a careful examination of this peculiar structure in specimens that he had obtained at Waterland Quarry, Dunlop, Ayrshire. In these specimens the cone structure is well preserved, and the upward termination of the cones on the surface of the bed is so clearly displayed that he has

been led to form a different explanation as to the origin of the structure from any of those formerly advanced. He stated, that in the explanations of former observers, "cone-in-cone" had been ascribed to the action of various causes, such as chemical precipitation, the action of pressure on concretions in process of formation, and to a kind of crystallisation in the stratum after the deposition of the sediment of which the bed is composed. Mr. Young pointed out, that in his specimens there are revealed external characters and points of internal structure which apparently had not been recorded, or at all events had been overlooked in all the descriptions that had come under his notice. Briefly stated, the following are the chief conclusions to which he had been led. 1st. That "Cone-in-cone" was in all probability formed by the upward escape of gases, generated in the sediments in which it is found by the decomposition of the organisms present; these being either plant remains, Entomostraca, shells or fishes, as seen in the specimens exhibited. 2nd. That the cones start from a point near the lower portion of the stratum, and ascend upwards; their bases gradually expanding as they reached the surface of the bed. 3rd. That there exists in all the cones, large and small, a central axis or tube, through which the gases escaped that elevated the calcareous sediment in successive layers, and of which the cone structure is built up. 4th. That the transverse wrinkling, seen upon the inner surface layers of the cones, appears to be due to a creeping downwards through gravitation of the plastic sediment upon the slopes of the cones in the intervals between the ebullition of the gases that elevated the sediment. 5th. That a thin layer of clay of varying thickness is seen to exist between the several calcareous layers of the cones, and which was probably deposited from the waters in which the cone structure was being formed; and that it is owing to this layer of clay that the cones now, in most instances, separate readily from one another when the stratum is fractured vertically. Transparent sections also show that this layer of clay must have been deposited within the cones whilst their bases remained open, the argillaceous layers being seen to unite with the central axis or tube. 6th. That coprolites of fishes, shells or other solid materials in the sediment are seen to have often interfered with the formation of the cone structure in their vicinity, and are sometimes found plugging up the orifice of a cone. 7th. That the cone structure was brought to a close in the stratum in which it exists by the gradual decrease of the gases that generated the mechanical action. In the Waterland specimens we find that the bases of the larger cones, where they terminate on the surface of the bed, are filled with groups of small minor cones, and that these continued in many instances

to erupt sediment, layer within layer, until their bases now rise above the general level of the stratum, indicating that the last ebullition of the gases was small in quantity and very feeble. Mr. Young in conclusion stated, that his remarks, and the explanation he offered on "cone-in-cone" structure, were wholly founded upon the specimens and sections exhibited, and in these he thought it was clearly evident that the formation of the structure was contemporaneous with the deposition of the sediment, which, from the nature of the organisms, appears to have been deposited over the area of wide, shallow, freshwater lakes, either as a thin stratum, or in lenticular or nodular masses. He had carefully studied the specimens exhibited, in connection with the other explanations of the structure that had been recorded, but he failed to find in the chemical, crystalline, or concretionary theories, an explanation that would serve to illustrate the varied points of structure that are seen in the best preserved specimens of "cone-in-cone" from Western Scotland.

The following Papers were then read :—

"Notes on Northern Minerals." By Thomas Wallace, Inverness (Communicated by the Local Secretary). (p. 168.)

"On the Chemical Composition of some Samples of Graphite from Aberdeen." By W. Ivison Macadam, F.C.S., F.I.C., &c. Edinburgh. (p. 172.)

"On the Chemical Composition of Butyrellite." By same. (p. 175.)

"Analysis of a Sample of Strontianite from Strontian." By same. (p. 173.)

The Local Secretary expressed the thanks of the Society to the Geological Society of Glasgow, and especially to Mr. Murdoch its Hon. Secretary, for the interest which had been taken in organising the present meeting.

The meeting closed with a vote of thanks to the Chairman.

EXCERPT MINUTES OF COUNCIL MEETING.

Held at the Museum, Jermyn Street, October 20th, 1885.

The following gentlemen were elected Members—

C. C. Ross, M.P., Carne, Penzance.
F. R. W. Daw, Marytavy, Tavistock.
John Daw, Jun., Bommelo, Haugesund, Norway.
G. F. Kunz, Hoboken, New Jersey.

The Draft Report was adopted for submission to the Anniversary Meeting.

MINUTES OF THE ANNIVERSARY MEETING.

Held at the Museum, Jermyn Street, October 20th, 1885, at 8 p.m.

The President, The Rev. Prof. Bonney, D.Sc., in the Chair.

Messrs. Solly and Miers were appointed Scrutineers of the Ballot for Officers and Council; they reported that 50 members had voted, and that the following were duly elected :—

President.	L. Fletcher, M.A., F.G.S.
Vice Presidents.	Rev. S. Haughton, M.D., F.R.S.
	Rev. Professor T. G. Bonney, M.A., D.Sc., F.R.S.
Council.	C. A. Burghardt, LL.D.
	A. Geikie, LLD., F.R.S.
	Rev. H. Gurney, M.A.
	Hugo Müller, Ph.D., F.R.S.
	Rev. W. W. Peyton.

(In place of Messrs. Fletcher, Gibb, Hall, l'Anson and Platnauer, the retiring Members.)

Treasurer.	R. P. Greg, F.G.S., &c.
General Secretary.	R. H. Scott, M.A., F.R.S.
Foreign Secretary.	T. Davies, F.G.S.
Auditors.	B. Kitto, F.G.S.
	F. W. Rudler, F.G.S.

The Secretary then read the following Report :—

REPORT OF THE COUNCIL OF THE MINERALOGICAL SOCIETY FOR 1884-5.

The Balance Sheet for the year 1884, which appeared in No. 28 of the Journal, showed that the finances of the Society were in a healthy condition, the excess of Assets over Liabilities amounting to £215 12s. 4d.

The number of Members and Associates elected during the year has been seven, and the number of resignations five, while the names of four Members and one Associate have been removed from the list for non-payment of subscriptions for three years. The Council regret that they have to report also the death of Alexander Murray, Esq., C.M.G., of St. John's, Newfoundland.

Three Meetings have taken place since the last Anniversary ; those in December and March were held in the Museum of Economic Geology, by kind permission of the Director-General

of the Survey; the third was held in Glasgow in the month of June, in the rooms of the Philosophical Society. This, the second Scottish Meeting, was, like its predecessor in 1884, a decided success.

Three parts of the Journal have been issued during the year. Among their contents the Council would especially draw attention to Mr. Miers' contributions, including his careful Index to the Mineralogical literature of the year.

Herr Sjögren's paper on Graphite also deserves notice; it is a translation from the Swedish, as it originally appeared in the Forhandlingar of the Stockholm Academy.

In conclusion, the Council would only remind the Members that it is very desirable that they should co-operate actively in the working of the Society by the contribution of papers to be read at its Meetings and published in its Journal. It is by such co operation alone that the Society can be maintained in a state of vigorous activity.

On the motion of the President, seconded by the Hon. Secretary, the Report was adopted.

The President then delivered his Address (p. 195).

Prof. Lewis then said:—

I rise to propose that the Society return its hearty thanks to Professor Bonney for the interesting Address which he has been good enough to give us, and for the able and pleasant manner in which he has presided over us during the last year.

The first portion of Prof. Bonney's address discussed an important but very difficult subject, the definition of the species, and the way in which it should be named. In the present state of our knowledge any thing approaching to a systematic nomenclature is hardly possible, and it is, therefore, probable that our present trivial names are the best, as they will stand less in the way of a systematic nomenclature than any others. In a discussion as to nomenclature which I had with Professor W. H. Miller some ten years ago, he expressed himself most strongly in favour of trivial names for minerals, and I have no doubt that he had this in mind. The definition of the genus or species is a matter which requires a wide knowledge of minerals—wider far

than is common amongst mineralogists. But any one who has ever attempted a classification of minerals will have learnt that the problem before him is one no less difficult than the well-known one of the librarian.

The second subject, the artificial formation of minerals, discussed by Professor Bonney, is one in which much progress has been made, and which is daily becoming more important. Besides the actual experiments made in our laboratories, we have, in various parts of the world, minerals being formed in a manner permitting of easy observation ; and now that we have mineralogical teaching in London, it is to be hoped that our mining engineers will receive a sufficiently general education to aid us by recording the changes which they perceive going on in the districts where they may be working. I can see few ways in which a greater or more important addition to our knowledge could be made.

I have, therefore, to request Prof. Bonney to allow his Address to be printed in the Journal.

The motion was seconded by Mr. Miers.

Professor Bonney then vacated the Chair, which was taken by Mr. Fletcher, the newly elected President.

The following Papers were read:—

H. A. Miers, M.A.—"On a Crystal of Orthoclase."

R. H. Solly, F.G.S.—"Notes on Minerals from Cornwall and Devon." (p. 202.)

Dr. Max. Schuster, of Vienna (Communicated by the President).—"Some Results of the Crystallographic Study of Danburite." (p. 213.)

The Hon. Sec. read the following letter:—

Chemical and Metallurgical Laboratory,
Pretoria, *July 27th*, 1885.
S.A.R.

The Secretary,
The Mineralogical Society,
London.

Dear Sir,

I enclose a small sample, together with my analysis, of a mineral found near here. It contains, as you will see, after deducting the quartz

with which it is mixed, 74·76 PbO. and 25·24 CrO_3, making the formula 4 PbO3 CrO_3. I am unable to find in any text books of Mineralogy at my command a description of any mineral having this composition, therefore, thinking it may perhaps be a new mineral, I concluded you would be able to give me some information on the subject. I have been unable to determine the crystalline form, as I have no instruments. The sample was brought to me by a Boer; he stated that he had obtained them by washing, and promised to bring me some more. I am sorry I am unable to send you a larger sample, but the total amount I received was not more than 4 or 5 grammes. There are many rare minerals in the country, and if you care to accept them I shall be very pleased to send you any samples I may come across. I have already found Telluride of Gold and Tin which, until then, was supposed not to exist in the Transvaal. I have also received a sample of *Native Metallic Zinc*, which I believe is also very rare. I shall hope to hear from you with regard to the Chromate of Lead.

And remain, Dear Sir,
Yours faithfully,
WILLIAM E. DAWSON.

CERTIFICATE.

Chemical and Metallurgical Laboratory,
Pretoria, *July 27th*, 1885.
S.A.R.

RESULT of the Analysis of a Sample of Lead Chromate received from on marked

Oxide of Lead - -	74·76 per cent.
Chromic Acid - -	25·24 ,, ,,
	100·00 per cent.

= 4 PbO3 CrO_3.

(Signed) WILLIAM E. DAWSON.

The President exhibited some Roman coins found near Chester, on which crystals of "Cuprite" were present.

Professor Lewis exhibited a crystal of "Colemanite."

MINERALOGICAL SOCIETY.

DONATIONS TO THE LIBRARY.

From April 1 to December 31, 1885.

Third and Fourth Annual Reports of the United States Geological Survey, by J. W. Powell; Geology of the Comstock Lode, with Atlas, by G. F. Becker; Comstock Mining and Miners, by Elliot Lord; The Copper-bearing Rocks of Lake Superior, by R. D. Irving; Palæontology of the Eureka District, by C. D. Walcott; Older Mesozoic Flora of Virginia, by W. D. Fontaine; Silver-Lead Deposits of Eureka, by J. S. Curtis; and Nos. 2 to 6 of the Bulletins of the U. S. Geological Survey. All presented by the United States Geological Survey.

The Rudiments of Mineralogy, by A. Ramsay, 3rd Edition; and the Prospector's Handbook, J. W. Anderson. Presented by Messrs. Crosby Lockwood & Co.

The American Journal of Science, monthly. Presented by the Editors.

The Young Mineralogist, Nos. 9 and 10. Presented by the Editor.

The American Chemical Journal, Vol. 7, Nos. 1 to 5. Presented by the Editor.

The Naturalist, monthly. Presented by the Editor.

Transactions of the North of England Institute of Mining and Mechanical Engineers. Vol. XXXIV., Parts II. to VI.: and an Account of the Strata of Northumberland and Durham as proved by borings (F to K).
Presented by the North of England Institute of Engineers.

Transactions of the Yorkshire Naturalists' Union, Part 8. Presented by the Union.

Proceedings of the Bristol Naturalists' Society, N.S., Vol. IV. Part III.
Presented by the Society.

Reports of Progress of the Geological and Natural History Survey of Canada for 1882-4, with Maps; and Catalogue of Canadian Plants, by John Macoun.
Presented by the Geological Survey of Canada.

Proceedings of the Academy of Natural Sciences of Philadelphia, Parts I to III., 1884.
Presented by the Academy.

Proceedings of the Colorado Scientific Society, Vol. I. Presented by the Society.

Annual Report of the Department of Mines of New South Wales for 1884.
Presented by the Department of Mines, Sydney.

Journal and Proceedings of the Royal Society of New South Wales, Vol. XVIII. Edited by A. Liversidge, F.R.S. Presented by the Society.

Analysis of Slate in contact with Granite, from Preservation Inlet, New Zealand; and On some New South Wales Minerals. Both by A. Liversidge, F.R.S.
Presented by the Author.

The Volcanoes of Barren Island and Narcondam, by J. W. Mallet, Geological Survey of India. Presented by the Author.

An Account of the Eruption of Mount Vesuvius, by J. M. Black.
Presented by the Author.

Smithsonian Report for 1883. Presented by the Smithsonian Institution.

Annuaire géologique universel, 1885. Presented by Dr. Dagincourt.

Description pétrographique des Roches des Terrains crystallins primaires et sédimèntaires du Massif de la Chaine du Mont Blanc. Par Venance Payot.
Presented by the Author.

Recherches sur la Composition et la Structure des Phyllades Ardennais, par A. Renard.
Presented by the Author.

Bulletin de la Société Minéralogique de France. Tome VIII. Nos. 1 to 7.
Presented by the Society.

Annales de la Société géologique de Belgique. Tome X., 1882-3.
Presented by the Society.

Catalogue des Ouvrages de Géologie, de Minéralogie et de Paléontologie, ainsi que des Cartes geólogiques. Par G. Dewalque.
Presented by the Geological Society of Belgium.

Mineralogische Notizen; Vorträge und Mittheilungen; and mineralogische Mittheilungen, Neue Folge. All by G. Vom Rath.
Presented by the Author.

Colemanit aus Californien. Von C. Bodewig und G. Vom Rath.
Presented by Prof. Vom Rath.

Ueber Vanadate und Jodsilber von Lake Valley, Donna Anna County, New Mexico. Von F. A. Genth und G. Vom Rath.
Presented by G. Vom Rath.

Ueber Datolith von Casarza, und Calciumhydroxyd; und Ueber Thüringer Mineralvorkommnisse. Von Dr. O. Luedecke.
Presented by the Author.

Ein Beitrag zur Morphologie des Leucits. Von H. Rosenbusch.
Presented by the Author.

Mineralogische und petrographische Mittheilungen. Von G. Tschermak. Neue Folge. Bd. VII. Heft 1, 2, 3.
Presented by the Editor.

Zeitschrift für Krystallographie und Mineralogie. Von P. Groth. Bd. IX. Heft 4 to 6; X. 1 to 6; and XI. 1.
Presented by the Editor.

Zeitschrift für Naturwissenschaften, 4 Folge, Band III. Heft 3 to 6; and IV. 1.
Presented by the Editor.

Jahrbuch der K. K. Geologischen Reichsanstalt, Bd. XXXV. Heft 1 to 4; and Verhandlungen, 1885.
Presented by the Institute, Vienna.

Grundfjeldsprofilet ved Mjøsens sydende. Af Dr. Th. Kjerulf.
Presented by the Author.

Mineralogiska och petrografiska Meddelanden, X., af F. J. Wiik.
Presented by the Author.

Bolletino del R. Comitato Geologico d' Italia. Nos. 11 and 12, 1884, and 1 and 2, 1885.
Presented by the Geological Survey.

Atti della Società Toscana di Scienze Naturali; Memorie, Vol. IV. fasc. 3; Vol. VI. fasc. 2; and Processi Verbali, Vol. IV.
Presented by the Society.

Atti della Reale Accademia dei Lincei. Rendiconti, Vol. I. fasc. 7 to 28; Vol. II. fasc. I.
Presented by the Academy.

Rivista geologica dei Terrani della Brianza. Nota del Sig. Giovanni Battista Villa.
Presented by the Author.

Osservazioni Meteorologiche fatte al R. Osservatorio de Campidoglio.
Presented by the Accademia dei Lincei.

Anales de la Sociedad cientifica Argentina. April and May 1885.
Presented by the Society.

THE MINERALOGICAL MAGAZINE
AND
JOURNAL
OF THE
MINERALOGICAL SOCIETY.

No. 33. DECEMBER 1886. Vol. VII.

Barytes from Addiewell, West Calder, in Midlothian.

By CHARLES O. TRECHMANN, Ph.D., F.G.S.

[Read June 22nd, 1886.]

THIS occurrence of barytes is somewhat remarkable and interesting from several aspects:—The peculiar conditions under which it seems to have been deposited, the limited quantity, and the perfection and richness of the crystallographic development.

It was found some two years ago in one of the shale pits of the Young's Paraffin Oil Company, and my friend Mr. J. S. Thomson, to whom I am indebted for two of the four or five existing specimens (of which one, I am happy to say, has been deposited in the Museum of Edinburgh), was so kind as to procure for me from the Mining Engineer of the Company a sketch of the Geological Strata of the neighbourhood, in which the position of the beds containing the crystals is indicated (Plate II.).

He writes as follows:—"The highest part of the section in that neighbourhood is the "Hurlet" or Main (carboniferous) limestone, and all depths are reckoned from this level. The crystals were found in a cavity in the sandstone at No. 15 shale pit at Addiewell; which cavity contained besides calcite, salt water, petroleum or liquid bitumen and solid bitumen or ozocérite (?)."—"It may perhaps be of interest to you to know that the presence of salt water may possibly be accounted for by the cavity where the crystals were found occurring just at sea level."

On the larger of the two specimens which I have thus been enabled to study, the crystals of barytes, accompanied by a few isolated crystals of iron pyrites, are irregularly disposed upon the bedding surface and edges of an irregular slab of "waterworn" or eroded fine-grained grey sandstone, the other side being occupied by crystals of calcite.

The barytes seem to be of two generations, of which the older, in thick tabular dull crystals of the form (001), (110), (101), (012), and about three-fourths of an inch in length, are covered by the younger transparent ones, which range in size from half-an-inch in length downwards to quite minute dimensions. On the smaller specimen no sandstone remains, and the small brilliant crystals of barytes are carried mainly on an aggregate of saddle-shaped lustrous rhombohedrons of pearlspar, among which lie covered crystals of older barytes, and an occasional speck of pyrites; while the lower surface is again occupied by a few clear calcites of the form : $(20\bar{1})$ R^3, (110) $-\frac{1}{2}$ R. The barytes crystals of the second generation are all of the same somewhat uncommon type of development, viz. elongated in the direction of the brachydiagonal axis, and governed by the forms (101) (012) (001) (010), while the smaller, perfectly limpid, crystals of some 2 mm. long show a large number of subsidiary forms, which give them in general the habit of the beautiful crystals from Chirbury, Salop ; a relationship which is the more distinctly characterised by the fact that on both of them the rare and hitherto almost unknown form E (412) is hardly ever absent.

The lustre of the faces is exceedingly perfect, so that even the smallest of them give perceptible reflections, and the measured angles of inclination approach so closely to those deduced from calculation, that the conclusion seems justified, that the rate of growth of these crystals must have been unusually slow. The impeding cause may be looked for in the presence of the mineral oil, of which considerable quantities have been taken up by many of the crystals, and which appears, under the microscope, enclosed in irregular rounded cavities, of which many again are flattened out in a direction parallel with the plane (101). The oil thus disseminated is of a brownish yellow colour, transparent, and of an intensity varying with the thickness of the layer. Each cavity contains a large gas bubble. Cubes of NaCl or crystals of other salts could not be detected.

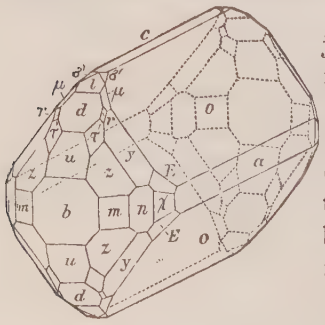


Fig. 1.

Eleven of the smallest crystals were subjected to examination, and on them a total number of 21 forms was observed, of which 6 seem to have hitherto been unknown. The distribution on each crystal is shown on Table I., the new forms being distinguished by an asterisk. Fig. 1 has been constructed as closely as possible after nature, and represents the general character of these crystals and the relative size of the principal planes.

TABLE I.

	Miller. $\bar{a} : \breve{b} : \dot{c}$	Naumann. $\breve{a} : \bar{b} : c$	Number of Crystal.										
			1	2	3	4	5	6	7	8	9	10	11
a	100	$\infty\breve{P}\infty$	—	—		—	—	—	—	—	—	—	—
b	010	$\infty\bar{P}\infty$	—	—	—	—	—	—	—	—	—		—
c	001	$0P$	—	—	—	—	—	—	—	—	—	—	—
m	110	∞P	—	—	—	—	—	—	—	—	—	—	—
n	210	$\infty\breve{P}2$	—	—	—	—	—	—	—	—	—	—	—
χ	310	$\infty\breve{P}3$	—	—	—	—	—	—		—	—	—	—
o	101	$\breve{P}\infty$	—	—	—	—	—	—	—	—	—	—	—
o^7*	701	$7\breve{P}\infty$	—										
l	014	$\frac{1}{4}\bar{P}\infty$	—	—	—	—	—	—	—	—	—	—	—
$d^{\frac{3}{8}}$*	038	$\frac{3}{8}\bar{P}\infty$	—			—	—	—		—		—	—
d	012	$\frac{1}{2}\bar{P}\infty$	—	—	—	—	—	—	—	—	—	—	—
u	011	$\bar{P}\infty$	—	—	—	—	—	—	—	—	—	—	—
z	111	P	—	—	—	—	—	—	—	—	—	—	—
r	112	$\frac{1}{2}P$	—	—	—	—		—	—	—	—	—	—
y	212	$\breve{P}2$	—	—	—	—	—	—	—	—	—	—	—
μ	214	$\frac{1}{2}\breve{P}2$	—	—	—	—	—	—	—	—	—	—	—
P*	434	$\breve{P}\frac{4}{3}$			—								
E	412	$2\breve{P}4$	—	—	—	—	—	—		—	—	—	—
τ'*	234	$\frac{3}{4}\bar{P}\frac{3}{2}$	—	—		—	—	—		—		—	—
λ'*	123	$\frac{2}{3}\bar{P}2$							—				
σ'*	5.11.55	$\frac{1}{5}\bar{P}\frac{1}{5}$			—								

The new forms are established on the following measurements and zones, the calculated angles being deduced from the parameters determined by Helmhacker on the barytes of Svárov:—$\breve{a} : \bar{b} : \dot{c} = \cdot 8152 : 1 : 1.3136$ as harmonising best with my measurements.

$o^7 = (701)$, $7\breve{P}\infty$ observed as an exceedingly narrow face on crystal No. 1.

	Measured.	Calculated.
$o^7 : 001$	$= 83°55\frac{1}{2}'$	83°47′36″

$d^{\frac{3}{8}} = (038)$, $\frac{3}{8}\bar{P}\infty$ observed on seven crystals and measured on four, as a narrow, generally somewhat rounded truncation of the edge (012) : (014).

Measured (Mean).	Calculated.
$d^{\frac{3}{5}} : 010 = 58°54'$	58°51'24"

maximum 60°32′ minimum 57°29′

It is an ill-defined form, tending towards the known forms (025) and (013), for which the calculated angles are respectively 57°11′46″ and 61°45′32″.

P = (434), $\breve{P}\frac{4}{3}$ once as a very narrow face in the zones (111) : (212) and (112) : (210),

Measured (Approx.)	Calculated.
P : (014) = 48°8½′	47°37′4″
P : (210) = 30°31½′	31°6′58″

τ' = (234), $\frac{3}{4}\breve{P}\frac{3}{2}$. A well characterised form with large and well developed faces in the zones (111) : (012) and (011) : (212),

Measured.	Calculated.
$\tau' : 012 = 25°19'$	25°20′30″
$\tau' : 111 = 13°46\frac{1}{3}'$	13°46′58½″
$\tau' : 212 = 24°48'$	24°46′29″

λ' = (123), $\frac{2}{3}\breve{P}2$ once as a narrow face in the zones (101) : (011) and (012) : (111,)

Measured.	Calculated.
$\lambda' : 111 = 20°33'$	20°39′16″
$\lambda' : 011 = 19°15\frac{1}{2}'$	19°54′23″

σ' = (5.11.55), $\frac{1}{5}\breve{P}^{11}_{5}$ as a small face on crystal No. 3. The simpler indices (1.2.10), $\frac{1}{3}\breve{P}2$ suggested themselves, in which case the face would have been zonal with the faces $(\bar{2}10) : (\bar{1}12) : (014)$. This was, however, not the case, the face σ' lay slightly out of the zone,

Measured.	Calculated. for (5.11.55)	(1.2.10)
$\sigma' : 101 = 48°27'$	48°29′39″	47°52′16″
$\sigma' : 014 = 7°36\frac{1}{2}'$	7°39′21″	8°12′22″
$\sigma' : 012 = 21°35\frac{1}{2}'$	21°55′48″	22° 7′10″

As the number of forms recognised on this mineral has much increased since the publication of Helmhacker's monograph and the remarkable "Atlas" of Schrauf, I have ventured, with the literature at my disposal, to give in the following table a list of 94 forms, of which those which have been observed on barytes found in Britain are indicated by the letters in the first column. These consist of 24 forms given in Greg and Lettsom's Manual, and of 15 new forms characterised by an asterisk, of which 7 were observed on the barytes from Chirbury and 8 on that of Addiewell, or a total of 39 British forms.

TABLE II.

British Forms.	Miller. $\bar{a} : \breve{b} : \dot{c}$	Naumann. $\breve{a} : \bar{b} : \dot{c}$	Helmhacker, 1871.	Schrauf, Atlas, 1872-73.	New Forms.	Locality.	Observer.
a	100	$\infty\breve{P}\infty$	1	*b*			
b	010	$\infty\bar{P}\infty$	12	*c*			
c	001	0P	22	*a*			
m	110	∞P	6	*m*			
	320	$\infty\breve{P}\frac{3}{2}$	5	*N*			
*n**	210	$\infty\breve{P}2$	4	*n*		Addiewell	
χ*	310	$\infty\breve{P}3$	3	χ		Addiewell	
	410	$\infty\breve{P}4$	2	*L*			
	450	$\infty\bar{P}\frac{5}{4}$			*h*	Telekes	Schmidt.
η	230	$\infty\bar{P}\frac{3}{2}$	7	η			
	350	$\infty\bar{P}\frac{5}{3}$	8				
λ	120	$\infty\bar{P}2$	9	λ			
	130	$\infty\bar{P}3$	10	β			
	140	$\infty\bar{P}4$	11	τ			
	108	$\frac{1}{8}\breve{P}\infty$	23	*a*			
	103	$\frac{1}{3}\breve{P}\infty$			*i*		Miers
ϕ	102	$\frac{1}{2}\breve{P}\infty$	24	ϕ			
	506	$\frac{5}{6}\breve{P}\infty$	25				
	809	$\frac{8}{9}\breve{P}\infty$		ϵ			
o	101	$\breve{P}\infty$	26	*M*			
	201	$2\breve{P}\infty$	27	*i*			
	401	$4\breve{P}\infty$			*x*	Binnenthal	Grünling
o^7*	701	$7\breve{P}_\infty$			o^7	Addiewell	
	10 0 1	$10\breve{P}\infty$			*x*	Telekes	Schmidt
	018	$\frac{1}{8}\bar{P}\infty$	21	*W*			
w	016	$\frac{1}{6}\bar{P}\infty$	20	*w*			
	015	$\frac{1}{5}\bar{P}\infty$	19	σ			
l	014	$\frac{1}{4}\bar{P}\infty$	18	*l*			
g	013	$\frac{1}{3}\bar{P}\infty$	17	*g*			
$d\frac{3}{2}$*	038	$\frac{3}{8}\bar{P}\infty$			$d\frac{3}{2}$	Addiewell	
i	025	$\frac{2}{5}\bar{P}\infty$		κ			
d	012	$\frac{1}{2}\bar{P}\infty$	16	*d*			

TABLE II.—*Continued.*

British Forms.	Miller. $\bar{a} : \breve{b} : \bar{c}$	Naumann. $\breve{a} : \bar{b} : \bar{c}$	Helmhacker, 1871.	Schrauf, Atlas, 1872-73.	New Forms.	Locality.	Observer.
	058	$\frac{5}{8}\bar{P}\infty$				Pésey	Fényes
	023	$\frac{2}{3}\bar{P}\infty$	15				
*Z**	034	$\frac{3}{4}\bar{P}\infty$			*Z*	Chirbury	Miers
	0 23 24	$\frac{23}{24}\bar{P}\infty$	14				
u	011	$\bar{P}\infty$	13	*u*			
	032	$\frac{3}{2}\bar{P}\infty$		*D*			
	021	$2\bar{P}\infty$		*U*			
	1 1 20	$\frac{1}{20}P$			*e*	Telekes	Schmidt
	119	$\frac{1}{9}P$	28	*H*			
k	118	$\frac{1}{8}P$	29	*k*			
	116	$\frac{1}{6}P$	30	*F*			
v	115	$\frac{1}{5}P$	31	*v*			
q	114	$\frac{1}{4}P$	32	*q*			
f	113	$\frac{1}{3}P$	33	*f*			
r	112	$\frac{1}{2}P$	34	*r*			
	223	$\frac{2}{3}P$	35	*R*			
z	111	P	36	*z*			
	441	4P			*p*	Telekes	Schmidt
*P**	434	$\breve{P}\frac{4}{3}$			*P*	Addiewell	
y	212	$\breve{P}2$	37	*y*			
	313	$\breve{P}3$	38	*I*			
	414	$\breve{P}4$	39	*ρ*			
	515	$\breve{P}5$	40				
	616	$\breve{P}6$		*ψ*			
*Q**	15 1 15	$\breve{P}15$			*Q*	Chirbury	Miers
	211	$2\breve{P}2$	41	Σ			
	311	$3\breve{P}3$	42	Φ			
	411	$4\breve{P}4$	43	*T*			
	511	$5\breve{P}5$	44	Ħ			
*ω**	432	$2\breve{P}\frac{4}{3}$			*ω*	Chirbury	Miers
μ	214	$\frac{1}{2}\breve{P}2$	50	*μ*			
	634	$\frac{3}{2}\breve{P}2$	54				

TABLE II.—*Continued.*

British Forms.	Miller. $\bar{a} : \breve{b} : \dot{c}$	Naumann. $\breve{a} : \bar{b} : \dot{c}$	Helmhacker, 1871.	Schrauf, Atlas, 1872-73.	New Forms.	Locality.	Observer.
	632	$3\breve{P}2$	53				
	316	$\frac{1}{2}\breve{P}3$	51				
s	312	$\frac{3}{2}\breve{P}3$	55	*s*			
	726	$\frac{7}{6}\breve{P}\frac{7}{5}$		∝			
	416	$\frac{3}{3}\breve{P}4$			*F*		Miers
*E**	412	$2\breve{P}4$	56		*E*	{ Chirbury, Addiewell }	
	514	$\frac{5}{4}\breve{P}5$		ζ			
	513	$\frac{5}{3}\breve{P}5$			*G*		**Miers**
	716	$\frac{7}{6}\breve{P}7$		θ			
	8 1 12	$\frac{8}{3}\breve{P}8$	52	Γ			
*Y**	19 1 18	$\frac{19}{18}\breve{P}19$			*Y*	Chirbury	**Miers**
Λ*	25 1 27	$\frac{25}{27}\breve{P}25$			Λ	Chirbury	**Miers**
	122	$\bar{P}2$	45	ν			
	133	$\bar{P}3$	46	∇			
	144	$\bar{P}4$	47	δ			
ξ*	232	$\frac{3}{2}\bar{P}\frac{3}{2}$			ξ	Chirbury	**Miers**
τ'*	234	$\frac{3}{4}\bar{P}\frac{3}{2}$			τ'	Addiewell	
λ'*	123	$\frac{2}{3}\bar{P}2$			λ'	Addiewell	
σ'*	5 11 55	$\frac{1}{5}\bar{P}\frac{11}{5}$			σ'	Addiewell	
	254	$\frac{5}{4}\bar{P}\frac{5}{2}$		Δ			
γ	132	$\frac{3}{2}\bar{P}3$	48	γ			
	3 11 6	$\frac{11}{6}\bar{P}\frac{11}{3}$		*t*			
	7 28 24	$\frac{7}{6}\bar{P}4$	58				
	3 15 10	$\frac{3}{2}\bar{P}5$	49	*X*		{ Probably with the }	{ identical following }
	11 55 30	$\frac{11}{6}\bar{P}5$			Π	Mittelagger	Busz
	178	$\frac{7}{8}\bar{P}7$	59				
	2 14 9	$\frac{14}{9}\bar{P}7$	57			{ Doubtless with the }	{ identical following }
	8 56 35	$\frac{8}{5}\bar{P}7$			$\Pi_,$	Mittelagger	Busz
	196	$\frac{3}{2}\bar{P}9$		π			
	1 10 7	$\frac{10}{7}\bar{P}10$			$\Pi_{,,}$	Mittelagger	Busz

Literature consulted.

Brooke and Miller,	1852.	Phillips' Mineralogy, p. 529.
Greg and Lettsom,	1858.	Manual of Mineralogy, p. 61.
Schrauf,	1864-78.	Atlas der Krystallformen des Mineralreiches III. Taf. xxx. 1872. IV. Taf. xxxi. xxxii. 1873.
Schrauf,	1871.	Sitzungsberichte d. K. Akad. Wien. LXIV.
Helmhacker,	1872.	Ueber Baryte des Eisensteinfuehrenden Boehmischen Untersilurs. Separatabdruck aus dem XXXII. Bande der Denkschriften der K. Akad. Wien. Min. Mitth. Tschermak, 1872, p. 71.
Kokscharow,	1875.	Materialien zur Mineralogie Russlands, VII. p. 25.
Schmidt,	1882.	Zeitschrift für Krystallographie u. Mineralogie, VI. p. 554.
Miers,	1882.	Zeitschrift für Krystallographie u. Mineralogie, VI. p. 600.
Miers,	1883.	*Nature*, XXIX. pp. 29 and 124.
Woodward	,,	,, ,, p. 77.
Grünling,	1884.	Zeitschrift für Krystallographie u. Mineralogie, VIII. p. 243.
Busz,	1885.	Zeitschrift für Krystallographie u. Mineralogie, X. p. 32.
Fényes,	1885.	Zeitschrift für Krystallographie u. Mineralogie, X. p. 89.

Francolite, a Variety of Apatite from Levant Mine, St. Just, Cornwall.

By R. H. Solly, F.G.S., Demonstrator in Mineralogy to the University of Cambridge.

[Read June 22nd, 1886.]

THE three varieties of apatite at present known to occur in Cornwall are the sea-green limpid crystals from St. Michael's Mount and other places, the dirty-white, semi-opaque, hexagonal prisms associated with axinite from Botallack Head, and the thin hexagonal plates, described and analysed by Prof. Maskelyne and Dr. Flight as coming from a new locality, now known, however, to have been obtained by the late Mr. Talling from Fowey Consols, and previously noted from this mine by Greg and Lettsom. To these must now be added a new variety which was lately brought to me as chalybite from the deep workings of Levant Mine, St. Just. The specimens are closely analogous to those analysed by Dr. Flight, but differ slightly in chemical composition and mode of occurrence.

The crystals are in the form of small hexagonal plates, rarely more than $\frac{1}{8}$th of an inch in diameter and less than $\frac{1}{16}$th thick, vitreous lustre, limpid and slightly iron-stained, associated with curved white vitreous crystals of calcite on iron-stained quartz with a little copper pyrites. They are aggregated in a very confused manner; some are apparently twinned about the plane x, but the measurements obtained are not sufficiently satisfactory to establish a new twin law. The crystals usually consist of three or more individuals grown parallel to the a $\{10\bar{1}\}$ plane.

When the aggregations are broken up a "face of junction" is obtained, lying a little out of the zone a, o. A definite reflection could not be obtained on account of the curvature of the face. Approximate angle 40°. No crystal was found exhibiting more than one of these faces, and since the position, shape and curvature of the face, and the approximate angle obtained, was similar in a number of crystals examined, I have ventured, for want of a better name, to call this face "a face of junction," as I cannot show that it is parallel to a possible plane of the crystal.

A crystal placed between crossed nicols in a Norremberg polariscope gave the familiar broken cross, with widely separated and highly coloured rings of apatite, and with the aid of a mica plate the sign of double refraction was found to be negative.

The specific gravity was found to be 3·186.

I am indebted to Mr. Robinson, who has sent me the following account of the analyses he kindly undertook for me of the crystals of apatite. It will be seen that the Ca CO_3 is present in very similar proportions in the two analyses he made. But whether we are to consider the CO_2 as chemically combined, and therefore replacing either the P_2O_5 or F, or merely as a mechanical mixture of Ca CO_3, such as is found in varying and microscopic quantities in the apatites from Canada, is a question which cannot be settled satisfactorily, since no simple chemical formula can be given for the proportions found by Mr. Robinson.

As, however, the amount of CO_2 in these two analyses from crystals broken from various specimens agrees so closely, I feel inclined to accept Dr. Flight's view, and consider that CO_2 sometimes replaces the other acids in this mineral.

Two Analyses of Crystals of Apatite.

By Henry Robinson, M.A., Downing College, Cambridge.

BEFORE commencing the analysis I sifted the crystals to remove all small ones and dust, and then picked out, as far as possible, the hematite and every thing which differed from the general mass of crystals. By these means I obtained a very uniform sample of fair sized crystals. The whole was then finely powdered and divided into two portions, of each of which an analysis was made. I had reason to suppose that in the analysis I made previously* some of what appeared as CO_2 was really fluorine, so before making these analyses I made some experiments to see if I could arrange the strength of my acid so that while the substance was dissolved, the hydro-fluoric acid should not be given off on boiling the solution for a reasonable time to get rid of the CO_2. By using a sufficient quantity of a dilute solution of nitric acid containing 147·5 grams of HNO_3 in the litre, I succeeded in my object. All dissolved in the cold except a few particles of hematite and quartz—2·0 mgrms. from 731·75 mgrms., and on boiling the solution and drawing air through it there was no taste of any acid but CO_2; the hematite also remained undissolved. As the hematite and quartz were evidently foreign to the mineral, I deducted the amount found of them from the substance originally taken, as also I did the very small quantity of water present, 0·2 mgrms. in 731·75 mgrms. There was scarcely a trace of iron dissolved, not enough to estimate. In the first of these two analyses I evaporated the nitric acid solution, obtained after estimating the CO_2 to dryness; converted the solids into chlorides, and went through the usual process to remove silica, but none was present. The lime was precipitated as oxalate and weighed as sulphate, the phosphoric acid was estimated in the ordinary way as magnesium pyro-phosphate, the CO_2 from the loss of weight after decomposing the mineral with the dilute nitric acid already mentioned. The fluorine was estimated indirectly as follows:—I took the necessary amount of lime from that found to convert the whole of the CO_2 and P_2O_5 into carbonate and phosphate, and the remainder I calculated as fluoride. For A 948·94 mgrms. of the mineral were taken, for B 727·3 mgrms.

* *Trans. R. G. S. of Cornwall*, 1886.

	A		B	
	Mgrms.		Mgrms.	
$Ca\,CO_3$	27·0 =	2·845 o/o	21·0 =	2·887 o/o
$Ca_3\,2\,PO_4$	836·1 =	88·108 ,,	648·8 =	89·206 ,,
$Ca\,F_2$	85·8 =	9·041 ,,	62·2 =	8·552 ,,
	948·9 =	99·994	732·0 =	100·645

In B there is most likely a slight error in excess in the phosphoric acid ; this brings the fluoride a little too low and the total too light. I should have said there was not more than a mere trace of chlorine present, if any.

The following analysis A was the mean analytical result obtained by Dr. Flight for francolite, and B expresses the proportions of the typical formula of apatite.

	A	B
$Ca_3\,2\,PO_4$	83·261	92·26
$Ca\,F_2$	7·683	7·74
$Ca\,CO_3$	5·104	—
Fe O & Mn O	0·913	—
Na O	0·694	—
$H_2\,O$	1·593	—
	99·248	100·00

Anglesite from Portugal.

By R. H. Solly, F.G.S.., Demonstrator in Mineralogy to the University of Cambridge.

[Read June 22nd, 1886.]

THESE crystals of anglesite were given to me by Dr. Gadow, the Strickland Curator to the University of Cambridge, who obtained them while on a zoological expedition to Portugal.

They were given to him by the agents at the San Domingos copper mines near the Guadiana river in the province of Algarve, South Portugal, as crystals strange and unknown to them.

The only Portuguese localities recorded at present for anglesite are far north of these mines.

The San Domingos mines are worked in a portion of the great metallic lode or bed which stretches from the S.W. of Portugal, across the southern portion of Spain, in the province of Huelva, in an E.S.E. direction, and appearing again in a similar manner and direction on the other side of the Mediterranean in Algeria. The age of the surrounding strata is a matter of dispute. Some geologists call them Silurian, others Devonian, but F. Römer is of opinion that they belong to a low horizon of the Culm measures.* The well-known Rio Tinto and Tharsis mines are worked in this lode.

These crystals of anglesite are of a reddish honey-yellow colour, semi-transparent, with vitreous to greasy lustre, conchoidal fracture, with no apparent cleavage. H. 3. They vary in size, the largest I have being 25 mm. by 20 mm., and 14 mm. deep. The form is that of a simple rhombic prism with basal plane. The *c* (001) plane has wavy striations parallel to the intersections of the planes *c* and *a*. The *m* plane shows polysynthetic growth. On holding a crystal up to the light and viewing it through the plane *c*, layers of different shades can be seen parallel to the *m* planes. The thickness of the layers seems to be governed by the depth and breadth of the "junction faces," which are described below. Some of the *m* planes exhibit indentations forming impression or false planes, sometimes called "junction planes;" also fine deep striations giving "vicinal junction faces." One of these false faces

* *Zeitschr. d. d. geol. Gesellsch.* 1876, p. 354.

is quite smooth, and makes an angle of 39° 53′ with m, 54° 10′ with m', and 60° 38′ with c (Fig. 2). This face is only perceived to be a false or junction plane through the impossibility of assigning to it simple indices, and also through the entire absence of the other planes on the best developed edges of the crystals required by the law of symmetry. The simplest indices that can be assigned to this face are (18 81 77).

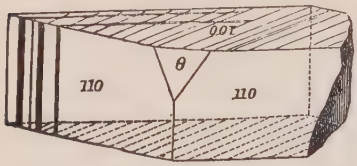


Fig. 2.

False planes formed by the impression of crystals of the same nature are well seen in the cases of some varieties of quartz and garnet, when groups of crystals of either minerals are broken asunder.

I have been unable to find any definite regularity existing either between the directions of the striations on the junction faces to the crystallographic edges of the crystal itself or to the penetrating crystal.

We ought not to be surprised that we can find no law for the above, if we take into consideration the numerous ways of aggregating observed on crystals which, as far as our knowledge goes at present, follow no law except in a few aggregations called twins. But it must be remembered that the junction faces due to the penetration of like crystals are rare, and that the general rule is that when an aggregation of crystals is broken, only a conchoidal or splintery fractured surface is obtained.

The junction faces obtained on crystals in rock masses due to the impression of different crystals, that is to say, different minerals, can be accounted for easily, as we are dealing with two distinct molecular growths, while in the above we are considering similar chemical compounds with similar molecules, endowed, as far as we know, with similar powers of affinity.

The crystals from the San Domingos mine were measured on my Fuess Goniometer, and the angle between the two best m planes gave 76° 9½′, which agrees well with the calculated values obtained by other observers, viz.

Miller	m m′	76° 22′
Kokscharow	,,	76° 16′
Krenner	,,	75° 34′

The specific gravity of the crystal weighing 317·42 grams was found to be 6·252. It was associated with a little galena, iron pyrites, and snow-white gypsum.

Scarcity of material has prevented a chemical analysis being made, which however is not needed for determination of the mineral.

On Plattnerite.

By Edward Kinch, Professor of Chemistry, Royal Agricultural College, Cirencester.

[Read June 22nd, 1886.]

THIS mineral, lead dioxide, does not seem to have been examined since it was first noticed by Breithaupt and Plattner in 1837 (*Journ. pr. Chem.* x. 508). This specimen, named "Schwerbleierz," is said to be probably from Leadhills, and the mineral is called, in the manuals of Dana and others, a doubtful species. It was named Plattnerite by Haidinger and subsequent authors.

A short time ago my friend Mr. Thos. Davies, F.G.S., of the British Museum, asked me to analyse a mineral from Leadhills, Lanarkshire, which he had had in his possession for some years, but the examination of which he had, from various causes, frequently postponed. On examination it was found to be lead dioxide—Plattnerite.

It is a black mineral, in globular or mammillated concretions, with crystalline exterior; with a velvety lustre on surfaces, the lustre of fractures being sub-metallic; fracture uneven; opaque, streak dark brown to puce colour; H. about 5; S. G. 8·54.

On heating it gives off oxygen, leaving a residue of litharge. With hydrochloric acid it gives off chlorine even in the cold, and on warming entirely dissolves, lead chloride separating out on cooling. The matrix consists mainly of lead carbonate (cerussite), with some chlorophosphate (pyromorphite); from these it was rather difficult to entirely separate the black mineral.

The prepared specimen was found to contain traces, but traces only, of water, carbon dioxide, lime, and ferric oxide.

It underwent no loss at 100° C.

On analysis of the carefully selected mineral the following results were obtained:—

Loss on ignition at a low red heat.—This loss was of oxygen with traces of carbon dioxide and of water.

·8805 gram lost ·0617 = 7·01 per cent.
·6522 ,, ,, ·0469 = 7·19 ,,

The residue from the first of these ignitions contained very small amounts of undecomposed mineral and of red lead, Pb_4O_5.

Estimation of lead protoxide.

·8805 gram gave 1·1061 $PbSO_4$ = 92·45 per cent. PbO
·616 „ „ ·7743 $PbSO_4$ = 92·46 „ „
·5492 „ „ ·6562 $PbCl_2$ = 92·83 „ „
·7865 „ „ 1·060 $PbCrO_4$ = 92·90 „ „

Estimation of oxygen over that required to form PbO.—This was estimated by treating the finely powdered mineral with strong hydrochloric acid in a small flask and distilling the liberated chlorine into a strong solution of potassium iodide, and afterwards estimating the liberated iodine with a solution of sodium thiosulphate, exactly as in Bunsen's method for estimating the value of manganese ores.

The equations representing the reactions are as under :—

$$PbO_2 + 4\,HCl = PbCl_2 + 2H_2O + Cl_2$$
$$Cl_2 + 2\,KI = 2\,KCl + I_2$$
$$2\,Na_2S_2O_3,\ 5\,H_2O + I_2 = 2\,NaI + Na_2S_4O_6 + 5\,H_2O$$

·4905 gram liberated iodine = ·03081 oxygen = 6·28 per cent. oxygen
·5492 „ „ „ = ·033575 „ = 6·11 „ „

One or two other methods of estimating the available oxygen were tried, but failed to give satisfactory results.

Mean of results.

Loss on ignition	7·10 per cent.
Lead protoxide, PbO, by direct determination... ...	92·66 „
	99·76
Equivalent to lead	86·01 „
Available oxygen in excess of PbO, by determination...	6·20 „
Water, carbon dioxide, ferric oxide, and lime... ...	traces

Lead dioxide requires

Lead	86·61 per cent.	or	Lead protoxide	93·31 per cent.
Oxygen	13·39 „		Oxygen	6·69 „
	100·00			100·00

Plattner (*loc. cit.*) found 86·2 per cent. of lead.

These results leave no doubt of its identity with Plattnerite (Schwerbleierz, *Breithaupt*), and remove all doubt from that species.

The specific gravity of this specimen is lower than that given by Breithaupt, which is 9·39 – 9·45. The sp. gravity of artificial PbO_2, variously prepared, is given by Herepath, 1824, *Phil. Mag.* lxiv., as 8·902; by Karsten, 1832, *Schweigger's Journ.*, lxv., as 8·933; by Playfair and Joule, 1849, *Journ. Chem. Soc.* 1, from 8·756 to 8·897; and by Werwicke, 1870, *Pogg. Annalen*, cxli., as 9·045; PbO_2, H_2O, given by the same author as having sp. gravity 6·267.

On a New Variety of Mineral from Cornwall.

By Prof. E. Kinch, F.C.S., F.I.C., and F. H. Butler, M.A., A.R.S.M.

With a Note on the Crystallographical Characters.

By H. A. Miers, M.A., &c.

[Read June 22nd, 1886.]

SOME two years since the authors received from East Cornwall examples of a crystallised mineral presenting features dissimilar to those of any species previously known to them, but presumably referable to Dufrenite. The specimens obtained were from the central part of a narrow neck of "dead ground" (compact ferruginous quartz rock) connecting the much broader E. and W. continuations of a lode, yielding respectively copper and tin ores.

The freshest crystals have a vitreous lustre, and vary in colour from almost black to a light apple-green, their sections, however, being of a yellow brown to yellow. Where, as commonly, some superficial chemical change has taken place—seemingly into limonite—the colour is from red to brown or yellowish brown. The crystals are aggregated for the most part to form squarish fasciculi, somewhat like files of bills, which are confusedly grouped together or incipiently stalactitic. From the definitely crystallised groups one may observe a passage into merely scabrous nodules and botryoidal masses on the smooth spherules of apparently ordinary Dufrenite. Where compact the mineral shows in section, not infrequently, a sequence of curved strongly contrasted red and green bands, doubtless the result of interstitial change along lines of accretion.

The unaltered (green) crystals have a hardness of about 4·5, and a specific gravity, in the powdered condition, of 3·233. Their qualitative analysis revealed the presence of ferric oxide, phosphoric anhydride, water, minute siliceous granules (gangue), a little CuO and CaO, and a slight trace of MgO, but no FeO or MnO. Neither uranium nor vanadium was detectible, and Al_2O_3 was absent except in the matrix. On ignition the crystals become red, and before the blowpipe they melt without much difficulty.

Quantitative analysis yields the following results :—

Water. No loss *in vacuo* over sulphuric acid. Loss at 100° C. traces only, 1·1502 grs. yielding ·0012 after some hours. By ignition

1·1485	lost	·1228	= 10·69 per cent.	Mean 10·62 per cent. H_2O
1·0073	,,	·107	= 10·62 ,,	
·9016	,,	·095	= 10·54 ,,	

Silica (Quartz sand, none combined) :—

1·1485 gave ·0056 =	·48 per cent.	Mean ·53 per cent.	SiO_2
1·0073 ,, ·0058 =	·57 ,,		
·9016 ,, ·005 =	·55 ,,		

CuO :—

1·1485 gave ·0102 =	·89 per cent.	Mean ·95 per cent.	CuO
1·0073 ,, ·0112 =	1·11 ,,		
·9016 ,, ·0078 =	·86 ,,		

P_2O_5 :—

·4594 gave ·217 $Mg_2P_2O_7$	= 30·21 per cent. P_2O_5	Mean 30·26 p. cent.	P_2O_5
·4029 ,, ·1922 ,,	= 30·51 ,, ,,		
·9016 ,, ·424 ,,	= 30·08 ,, ,,		

Fe_2O_3 (Dry method) :—

1·1485 gave phosphate pp. ·9794	= 85·28 per cent.	Mean 85·40 per cent.	
1·0073 ,, ,, ,,	·866 = 85·97 ,,		
·9016 ,, ,, ,,	·779 = 84·96 ,,		

whence by difference 55·14 per cent. Fe_2O_3.

Volumetrically (1 cc. $K_2Mn_2O_8$ solution = ·00785 Fe_2O_3) :—

·2297 = 16·5 cc. =	56·38 per cent.	Mean 55·63 per cent.	F_2O_3
·2014 = 14·2 cc. =	55·35 ,,		
·839 = 59·1 cc. =	55·28 ,,		
·5944 = 42·4 cc. =	56·16 ,,		

CaO :—

1·0073 gave ·016 CaO	= 1·59 per cent.	Mean 1·50 per cent.	CaO
·9016 ,, ·0227 $CaCO_3$	= 1·41 ,,		

Collecting the above results we have :—

H_2O	= 10·62
SiO_2	= ·53
CuO	= ·95
P_2O_5	= 30·26
Fe_2O_3	= 55·63
CaO	= 1·50
MgO	= traces
	99·49

Eliminating the ·53 per cent. of SiO_2 we obtain the following proportions :—

		Oxygen.
H_2O	= 10·68	9·49
CuO	= ·96	·19
P_2O_5	= 30·42	17·14
Fe_2O_3	= 55·93	16·78
CaO	= 1·51	·43
	99·50	

Calculated as Fe_2O_3 the CaO and CuO give respectively the numbers 1·44 and ·65 = 2·09. Correcting for the amount ·38 lost by conversion of CaO and CuO, we get finally the percentages:—

H_2O	= 10·72
P_2O_5	= 30·54
Fe_2O_3	= 58·24
	99·50

These numbers lead to the formula

8 H_2O	= 10·51
3 P_2O_5	= 31·09
5 Fe_2O_3	= 58·40
	100·00

Three principal formulæ have been applied or are applicable to minerals under the name of Dufrenite, viz.:—

(1)	(2)	(3)
per cent.	per cent.	per cent.
2 Fe_2O_3 = 62·0	3 Fe_2O_3 = 56·21	5 Fe_2O_3 = 58·40
P_2O_5 = 27·5	2 P_2O_5 = 33·25	3 P_2O_5 = 31·09
3 H_2O = 10·5	5 H_2O = 10·54	8 H_2O = 10·51
Oxygen ratio 6 : 5 : 3	9 : 10 : 5	15 : 15 : 8

[Or the last with $7\frac{1}{2}$ molecules of water = Fe_2O_3 58·78, P_2O_5 31·3, H_2O 9·92 = 2 : 2 : 1.]

The first of these is adopted by Maskelyne[1], Church[2] and others, and agrees with the analyses of Karsten[3] and Diesterweg[4] of the dark green mineral from near Siegen, and those of some others.

Our results point, undoubtedly, to the third formula, and this is supported, at all events so far as the ratio of base to acid is concerned, by analyses of Streng, Boricky, and others, though most of these show rather less water than in our Cornish specimens, and always included ferrous oxide.

Apart from chemical considerations, from the description given by Streng[5] of the physical characters of crystallised Kraurite (Dufrenite), from Waldgirmes, near Giessen, there can be little hesitation in concluding

[1] *Journ. Chem. Soc.* 1875 [2]. XIII. 586.
[2] *Chem. News*, 1864, X. 157.
[3] *Arch. f. Bergb. u. Hütt.* XV. 243.
[4] *Berg. u. Hütt. Zeitung*, XXII. 257.
[5] *Neues Jahrb. f. Min.* 1881 (1), p. 101.

that it is identical with the mineral now under consideration. Streng's analytical results, however,—

Fe_2O_3	= 60·20	= ·376	= 3·35 or 5·0 or 3·00.
FeO	= 1·53	= ·021	= 0·02
P_2O_5	= 31·82	= ·224	= 2·00 or 3·0 or 1·78.
H_2O	= 8·03	= ·446	= 4·00 or 6·0 or 3·50.
	101·58		

answering to the formula 5 Fe_2O_3, 3 P_2O_5, 6 H_2O, differ from the authors' in the presence of FeO and the absence of CaO and CuO, in containing less water by 2½ per cent., and in being, moreover, too high by over 1½ per cent.; Boricky's[1] analyses of Dufrenite (Kraurite) from St. Benigna, Bohemia, giving—

Dark-green variety.			Light-green variety.		
	Per cent.			Per cent.	
P_2O_5	= 30·05	1·7 or 2·0	P_2O_5	= 32·09	= 1·87 or 2·0
Fe_2O_3	= 59·82	= 3·0 or 3·6	Fe_2O_3	= 57·93	= 3·0 or 3·2
H_2O	= 9·33	= 4·1 or 5·0	H_2O	= 9·04	= 4·1 or 4·8
FeO & Mn_2O_3	= traces.		FeO & Mn_2O_3	= traces.	
	99·2			99·06	

and C. A. Kurlbaum's[2] of radiated Dufrenite from Allentown, New Jersey,

	Per cent.
SiO_2	= 0·72
Fe_2O_3	= 53·74
FeO	= 3·77
P_2O_5	= 32·61
H_2O	= 10·49
	100·95 (*sic*, but = 101·33)

more closely resemble those obtained for the Cornish crystallised mineral in question. It would appear, in fact, that Kurlbaum's specimens contained some Vivianite, probably as a result of commencing chemical change. Calculating all the iron oxide as Fe_2O_3 = 57·51 per cent. he deduces the formula:

3 Fe_2O_3	2 P_2O_5	4 H_2O
57·31 per cent.	34·10 per cent.	8·59 per cent.
but 3 Fe_2O_3	2 P_2O_5	5 H_2O
56·21 ,,	33·25 ,,	10·54 { per cent. seems more probable.

[1] *Bericht. Ak. Wien.*, 1867, LVI. 6.

[2] *Silliman's Am. J. of Science*, 1857 [2], XXIII. 423.

Another American specimen from Rockbridge County, Virginia, occurring in nodular masses with a radiated structure, being made up of slender prisms closely compacted, of a very dark blackish green colour and greyish green streak, has been analysed by F. A. Massie[1] and by L. Campbell[2] with almost identical results. The former found H_2O 8·35, SiO_2 ·20, P_2O_5 31·66, Fe_2O_3 50·89, FeO 6·06, Al_2O_3 ·29, MnO ·24, MgO 2·16.

It may be noted here that the percentage of water given for Dufrenite by Church, 10·5 per cent. is almost exactly the same as that found by the authors of the present paper. Maskelyne's formula requires this percentage of water, but a lower proportion of P_2O_5 and a higher proportion of Fe_2O_3 than in the mineral now in question. The identity of the two seems therefore far from clear.

Further chemical examination of pure examples of the ordinary Cornish Dufrenite is perhaps desirable, and one of us is now at work on this.

The crystallised phosphate just described is the only Dufrenite (?) in which copper has been noted, though the occurrence of Dufrenite with Chalcosiderite and its resemblance to that mineral have been noticed. The latter mineral contains over 8 per cent. of copper, and a higher percentage, 15, of water, and also about 4½ per cent. of alumina, but there is a similarity between our formula for the mineral forming the subject of this paper and Maskelyne's (*loc. cit.*) for Chalcosiderite, 3 Fe_2O_3, CuO, 2 P_2O_5, 8 H_2O, the oxygen ratio of base to acid being the same in each case, **1 : 1.**

Also the evidence of certain specimens in the possession of the authors points pretty conclusively to the occasional origin of brilliantly crystallised Chalcosiderite in the decomposition of this phosphate—presumably by the infiltration of a solution of some copper salt, and replacement thereby of an equivalent amount of ferric oxide by copper oxide, with simultaneous addition of water.

From Maskelyne's Andrewsite the crystals under consideration differ in composition chiefly in the absence of ferrous oxide, and in containing less than a tenth as much cupric oxide.

We submit that there is evidence that this mineral (as well as others described under the head Dufrenite) contains a larger proportion of phosphoric acid to base than is compatible with the usual formula given for Dufrenite, 2 Fe_2O_3, P_2O_5, 3 H_2O; and that (unless it should be afterwards shown that some of the earlier analysed specimens contained iron oxides

[1] *Chemical News*, 1880, XLII. 181.
[2] *Amer. J. Science*, 1881 [3], XXII. 65.

as impurities) the species must be divided into two, one having the formula 5 Fe_2O_3, 3 P_2O_5, 8 H_2O (or possibly in some cases less water).

Having regard to the conclusions we have so far arrived at, it is not our intention to propose a new name for this mineral.'

Note by H. A. Miers.

The crystals occur in the form of rectangular tables about 1 to 2 mm. in length and breadth, and $\frac{1}{4}$ to $\frac{3}{4}$ mm. in thickness; they may be regarded in all probability as orthorhombic plates formed by the macropinakoid faces {010}, bevilled at the sides by small faces of the prism {110}, and bounded at top and bottom by the basal planes {001}, the latter, however, sometimes rounded into a low brachydome. The best measurements gave an angle of 86°26′ for the prism, and 12°45′ for the inclination of the flat dome to the basal plane; but the crystals are so invariably grouped into penetrating bundles that it is almost impossible to find one which can be regarded as strictly a single individual, consequently neither the system nor the dimensions could be determined with certainty. The groups are generally sheaf-like aggregates, in which the plates radiate from a central axis and have their basal planes nearly parallel; the crystals are also frequently heaped together into confused rounded masses, in which the basal planes all lie outwards, and these again pass into smooth spherical and botryoidal concretions of radial structure. Sections parallel to the macropinakoid show marked dichroism, and between crossed nicols extinguish parallel and perpendicular to the prism edges. The crystallographic characters agree closely with those of Dufrenite from Waldgirmes, near Giessen, described by A. Streng (*Op. cit.* p. 110), and the habit is nearly that of fig. 7 in the plate accompanying his description.

Cassiterite of the Straits Settlements.

By J. H. Hampton.

[Read October 26th, 1886.]

THE tin from the Straits Settlements has hitherto been solely derived from the alluvial deposits, and is consequently in the form of alluvial or "stream" tin—each grain of Cassiterite being separate, and in many cases so considerably water-worn as to afford evidence of its having been washed down for a considerable distance; the angles of the grains having given place to smooth surfaces during their deposition.

The largest grains occur on the tops of some of the hills, with a diminution in size noticeable with distance from the hills.

The mineral is contained in beds of pebble-shaped quartz and granite, which denote the Cassiterite-producing "Wash"; these vary in thickness from a few inches to several feet, and contain from ½ to 30 per cent. of the mineral. The wash rests on a bed of kaolin, or on the bed rock, which is granite, syenite, or limestone, the crevices in which are often found to hold a high percentage of the mineral. More Tourmaline is noticeable in these deposits than I have seen in Cornwall or Tasmania, and as other impurities are rare, the Cassiterite is easily separated from minerals of less specific gravity and prepared for smelting. Pyrites is occasionally found, but its existence is an exception to the rule.

Cassiterite has a wide range in the Malay Peninsula, and is visible in some places on the surface of the ground and at depths ranging to sixty feet.

White Cassiterite is of frequent occurrence, and occasionally I have seen specimens of "ruby ore," and imperfect crystals with one or two planes uninjured; these appear to have become fractured at some remote period, as in most cases the fractures are water-worn.

Individual specimens of the mineral are found which suggest the possibility of its being traced to its original matrix.

On the Occurrence of considerable Deposits of Limonite (Bog Iron Ore) in North-west Ross-shire.

By W. Ivison Macadam, F.I.C., F.C.S., Professor of Chemistry, New Veterinary College, Edinburgh.

[Read October 26th, 1886.]

DURING the course of an inquiry into the nature and extent of the less known iron ore deposits of Scotland undertaken in connection with a paper to be communicated to the Society of Antiquaries of Scotland during the Winter Session 1886-87, I have been led to consider certain masses of Bog Iron Ore which are distributed somewhat widely over the less cultivated portions of the country. The present communication deals only with the north-westerly portion of Ross-shire, and most of the localities are within the parish of Gairloch.

1. *Cove.*—A small township some seven miles north-west of Poolewe. The deposit is not of great extent, and now occupies a raised position, the harder iron oxide having resisted the action of the elements more successfully than the loose sandy soil by which it was surrounded.

2. *Inverasdale.*—A township about four miles north-west of Poolewe. The locality contains very considerable deposits of the mineral. During the short stay we made four somewhat large "pans" were discovered, and from the fact that masses of the substance were found used as building stones in the drystone dykes in the neighbourhood there are doubtless many more deposits in the locality. At the time of my visit the crofters' patches were under oats, which hindered proper investigation. The principal deposit was found directly opposite the schoolhouse, and two others to the seaward of the same building, with a less deposit to the south of the school.

3. *Laid School.*—On the road, in a cutting directly above Laid School, a small deposit of poor ore occurs.

4. *Laid Churchyard.*—Loch Gruinard. The deposit occurs on ground now enclosed as a cemetery. The extreme hardness of the mass has saved it from being broken up. The deposit is about six inches thick and covers a considerable area.

5. *North Erradale.*—About six miles north-west of Gairloch village and half-a-mile from the sea. The deposit is not great.

6. *Little Sand.*—On the shore of the Gairloch, and about 3½ miles

north-west of the village of Gairloch. The deposit is about 50 feet above the shore line.

7. *Lonmor.*—About a mile and a half nearer Gairloch village than the preceding deposit. The substance is about 150 feet above sea-level.

8. *Strath of Gairloch.*—About 2 miles north of Gairloch village, and about 150 feet above sea-level.

9. *South Erradale.*—This township lies to the south-west of Gairloch. It occupies a flat strath formed by the Abhuiun Ruadh or "red burn." The extent of this deposit is enormous, covering acres of land. It averages from 9 to 18 inches thick, and has been utilised by the inhabitants for building the walls forming the boundaries of the township. One large "dyke" is called the "iron dyke," and is wholly composed of the Bog Ore. There must be some hundreds of yards of these "iron dykes." The material is still being formed, and the locality is certainly one of the most rich in the country for this particular iron ore.

10. *Point of Gairloch*, or the "Red Point." About 3 miles further south than the preceding a deposit has been found of considerable depth and extent.

Several of the samples taken from these localities have been tested for iron, and the results obtained are as follows:—

Bog Iron Ores from Gairloch Parish, North-west Ross-shire.

		Ferric Oxide.	*Equal to Metallic Iron.*	*Silica.*
1. Cove ...	(*a*)	72·54	50·77	3·56
	(*b*)	5·48	3·83	85·92
5. North Erradale	(*a*)	69·84	48·88	2·61
	(*b*)	55·42	38·79	12·64
6. Little Sand...		73·68	51·57	4·72
7. Lonmor ...		73·16	51·21	3·84
8. Strath of Gairloch		30·48	21·33	60·56
9. South Erradale	(*a*)	70·88	49·61	7·48
	(*b*)	66·68	46·67	8·24
10. Point Gairloch	(*a*)	71·04	49·72	10·61
	(*b*)	20·84	14·58	61·08

Further Note on Agalmatolite in Gairloch Parish, Ross-shire.

By W. Ivison Macadam, F.I.C., F.C.S., Professor of Chemistry, New Veterinary College, Edinburgh.

[Read October 26th, 1886.]

IN my previous communication* I drew attention to an impure variety of Agalmatolite found on Creag Mhôr Thollie, and which contained an excess of silica. A similar body was referred to in connection with Mr. Hamilton Bell's paper on "New Localities for Agalmatolite"† as having been obtained from Ballater Pass. In connection with the material obtained at Creag Mhôr Thollie, I expressed the opinion that the agalmatolitic mineral had been formed in the presence of an excess of silica which had become combined with the other ingredients, forming what I then termed a "Siliceous Agalmatolite."

During the past summer I have again had an opportunity of examining the Creag, and towards the northmost end found very large masses of the pure mineral. The colour of the substance is the usual pea-green tint, greasy to touch, soft to the knife, and fracture conchoidal. The quantity present is large, and the various transition appearances are readily observed. It much resembles the Kean na Binn and Lua Yayi samples. It is frequently found to pass into less pure varieties, resembling the material referred to on page 29. The chemical analysis gave:—

	Agalmatolite. *Creag Mhôr Thollie, Ross-shire.*
Silica	50·362
Alumina	32·015
Ferric Oxide	2·207
Magnesic ,, ...	0·523
Calcic ,, ...	0·086
Potassic ,, ...	7·833
Sodic ,, ...	0·121
Water	6·742
	99·889

* Vol. VII. p. 29.

† Vol. VII. p. 28.

On the Analysis of a Sample of Talc used in Paper-making.

By W. Ivison Macadam, F.I.C., F.C.S., Professor of Chemistry, New Veterinary College, Edinburgh.

[Read October 26th, 1886.]

THE mineral to which this notice refers is obtained from New Jersey. It is very largely employed for paper-making in place of China clay (Kaolin), and gives, amongst other advantages, a much more pure effluent, fully ninety per cent. being retained in the paper. From its fibrous nature it appears to attach itself to the smaller paper particles and retain these also. The very high and beautifully smooth glaze of the American papers is largely due to the use of this substance.

The mineral is of a highly fibrous character, almost pure white, perfectly insoluble in water, is greasy to the touch, and readily broken down in the fingers. Its specific gravity ranges from 2·22 to 2·562 (water 1·000). Commercial name *Agalite*.

Analysis.

Silica	62·077
Magnesic Oxide	33·126
Ferrous Oxide	0·104
Aluminic Oxide	0·313
Water of Hydration	4·286
Loss and Undetermined	0·094
	100·000

Analyses of Samples of China Clay (Kaolinite), Cornwall.

By W. Ivison Macadam, F.I.C., F.C.S., Professor of Chemistry, New Veterinary College, Edinburgh.

[Read October 26th, 1886.]

No.	*Silica.*	*Aluminic Oxide.*	*Ferric Oxide.*	*Calcic Oxide.*	*Magnesic Oxide.*	*Potassic and Sodic Oxides, &c.*	*Moisture.*
1	61·02	28·64	1·96	2·36	0·45	1·76	3·81
2	64·75	21·24	3·64	2·71	0·32	0·92	6·42
3	62·62	27·48	2·14	2·22	0·44	1·54	3·56
4	56·96	29·82	4·96	2·56	0·59	1·48	3·63
5	56·86	28·24	5·72	2·63	0·81	1·46	4·28
6	61·47	26·12	3·48	2·46	0·72	1·32	4·43
7	75·91	10·63	5·32	2·45	0·71	0·64	4·34
8	44·18	34·43	0·42	1·86	0·52	1·68	16·91
9	44·82	35·61	0·48	1·92	0·61	1·52	15·04
10	43·62	35·12	0·47	1·89	0·54	1·94	16·42
11	49·65	45·24	0·34	1·53	0·52	0·78	1·96
12	50·12	39·16	0·43	2·16	0·89	2·32	4·92
13	49·24	39·84	0·57	2·34	0·93	2·47	4·61
14	47·43	39·42	0·28	0·92	0·33	2·31	9·31
15	50·31	38·12	0·24	0·89	0·31	2·42	7·71
16	51·55	34·17	0·28	1·13	0·38	1·97	10·52
17	49·12	36·94	0·26	0·83	0·27	2·08	10·50
18	50·29	36·17	0·25	0·85	0·29	1·82	10·33
19	47·65	36·18	0·26	0·82	0·29	2·06	12·74
20	67·92	22·52	0·31	1·58	0·51	0·44	6·72
21	66·96	23·56	0·37	0·84	0·41	0·70	7·16
22	76·04	13·76	0·22	1·06	0·39	2·05	6·48
23	69·60	22·44	0·21	0·96	0·42	1·69	4·68
24	59·88	26·68	0·24	0·71	0·34	7·43	4·72
25	48·24	38·83	0·34	0·74	0·29	6·40	5·16
26	65·52	25·12	0·24	0·71	0·28	2·95	5·18
27	66·36	24·32	0·31	0·68	0·27	3·18	4·88

Specific Gravity from 2·4 to 2·6 (Water 1·000).

Note on the Identification of the Scotch and New Brunswick "Albertites."

By the Rev. D. Honeyman, D.C.L., F.R.S.C., Curator of the Provincial Museum, Halifax, Nova Scotia.

(Communicated by Professor W. Ivison Macadam.)

[Read October 26th, 1886.]

PROF. TENNANT, of London, and I, identified the two "Albertites" in 1862. I was then a Commissioner for Nova Scotia at the Great Exhibition. In the neighbouring Court of New Brunswick there was a tub full of specimens of Albertite, which were freely given to visitors by Mr. Daniel, the Commissioner for New Brunswick, and myself.

It was, therefore, no astonishment when the Professor's assistant put into my hand a piece of "Albertite" as I entered the shop, and asked me what I thought of it. I said, "It is a piece of our New Brunswick Albertite." He replied, it was not from New Brunswick, but from some part of England, and showed me a boxfull that had just been received. The only guide to the locality whence it came were the markings on the lid of the box—"Aberdeen Railway" and Kiltearn. A Scotchman could recognise Scotland in "Earn." On referring to Murchison and Geikie's map, I soon found Kiltearn, and observed that the Old Red Sandstone was the formation that produced the mineral. One of the specimens had a piece of micaceous rock attached. The Professor told me that he had received the box from a Mr. Mackenzie. We made a comparative examination of the two Albertites. The result was communicated to Mr. Mackenzie, with a copy of Dawson's paper on the New Brunswick Albertite, contained in the *Quarterly Journal of the Geological Society of London*. At the Geologist's Club I showed the piece with the rock attached to Prof. (Sir) Andrew Ramsay. He immediately said that it was a piece of our *Nova Scotia* Albertite, but was somewhat astonished when I told him it was from Kiltearn, Scotland. I gave him the specimen. He said he would put it in the Museum. Another of those pieces is preserved in our Provincial Museum, where it lies beside a New Brunswick specimen for the purpose of comparison. The only difference observable between the two is in the shade of colour. The Scotch specimen is blacker than the other.

It is not generally known that the New Brunswick mineral was first brought into notice by Dr. Abraham Gerner, F.G.S., the pioneer geologist of Nova Scotia and New Brunswick. He maintained that it was an

asphalt and not a coal, and applied it as the former to the manufacture of gas, in opposition to a monopoly of making gas from coal. There was a litigation and a diversity of opinion in reference to the nature of the substance. It consequently received the name Albertite, from Albert County, New Brunswick, where it is found.

After doing good service in the manufacture of gas in New Brunswick, Nova Scotia, and elsewhere, for a number of years, the deposit was exhausted. Another locality called Belleveau was operated for Albertite without success. Prof. Burwash, *Trans. Institute of Nat. Science*, Vol. IV. p. 309.

The bituminous shales containing the Albertite have produced a large number of ganoids, large and small, chiefly of the genus *Palæoniscus*. This and Belleveau are the only localities where we find fishes entire in the carboniferous formation of Nova Scotia and New Brunswick. The bituminous shales of Antigonish County have abundance of scales of *Palæoniscus*. In corresponding shales of Horton Bluff, also in Nova Scotia, I have collected *Palæoniscus* scales and teeth, separate, and in a lower jaw. Various Lepidodendra have been found associated in the Antigonish shales.

Albertite is thus found in the Lower Carboniferous formation in New Brunswick, and the Old Red Sandstone of Kiltearn (Strathpeffer). How it was inserted in the one and the other yet requires to be demonstrated.

Note on Schorlaceous Rocks from near St. Austell.

By F. H. Butler, M.A., A.R.S.M.

[Read October 26th, 1886.]

CERTAIN specimens of rock lately obtained by me from the "Single Rose" Clay Work, near St. Austell, Cornwall, examples of which are now submitted to the Society, illustrate well the processes by which, in some instances at least, granite has been transformed into an aggregate of quartz and schorl.

A comparison of the chemical composition of orthoclase from Roche with that of kaolin from the neighbouring district of St. Stephen's shows that in the passage of felspar into China clay there is approximately a loss of 26 per cent. SiO_2 and a gain of 19 per cent. Al_2O_3 and 12 per cent. H_2O. In the St. Austell district, the evolution of Gilbertite would appear to be one of the possible stages in the gradual disintegration and disappearance of granitic felspar: both its chemical composition and its mode of occurrence point to this conclusion.

Orthoclase. Glass Mine, Roche (Phillips).		Gilbertite. Stenna Gwynn (Lehunt).		Kaolin. St. Stephen's (Boase).	
SiO_2 ...	65·00	SiO_2 ...	45·15	SiO_2 ...	39·55
Al_2O_3 ...	19·00	Al_2O_3 ...	40·11	Al_2O_3 ...	38·05
Fe_2O_3 ...	·50	FeO ...	2·43	MgO ...	1·45
CaO ...	1·57	MgO ...	1·90	K_2O & loss	8·70
MgO ...	trace.	CaO ..	4·17	H_2O ...	12·30
K_2O ...	10·37	H_2O ...	4·25		
Na_2O ...	2·40				100·05
H_2O ...	·83		98·01		
	99·67				

In this district the kaolinisation of the granite has, moreover, as perceptible in the specimens exhibited, been frequently associated with the production of schorl. This mineral has by degrees more or less completely pervaded the rock-mass, crystallising out in the minute cavities formed in it during the removal of constituents.

A synchronous and perhaps also slightly precursory stage of alteration is shown in the black highly schorlaceous rock in which the kaolin, with the exception of traces, has been removed from the cavities originally

occupied by crystals of orthoclase, and these have been filled with somewhat loosely cemented crystalline granules of quartz. The silicification of the rock, as the employment of a lens proves, must certainly have set in previous to the period of the full development of the schorl; for this latter mineral may be seen to have penetrated but little into the pseudomorphous quartz casts, and also to have formed a pretty well-defined line of demarcation about the same. It is, of course, open to conjecture whether the quartz is in part represented by silica once entering into the composition of the felspar that has disappeared.

On the Relations between the Solution-planes of Crystals and those of Secondary Twinning; and on the Mode of Development of Negative Crystals along the former. A Contribution to the Theory of Schillerization.

By Prof. John W. Judd, F.R.S., P.G.S.

Plate III.

In the case of many common rock-forming minerals—the felspars, the pyroxenes, the olivines and the micas—it has been shown that the crystals which have existed in rock-masses at great depths exhibit constant and characteristic differences from the crystals of the same mineral, in rocks of identical composition, which have been formed at the surface. It has been proved, moreover, that these differences become more and more pronounced in proportion to the distance from the surface at which these rocks have originally existed.*

Although some of these peculiarities of the crystals of deep-seated rock-masses can be satisfactorily accounted for by the conditions of pressure and slow growth under which they were originally formed, yet there are others—and these by no means the least striking of them, such as the continuous bands of fluid-enclosures, the avanturine structure and schiller, and the chatoyant phenomena—which are clearly not original, but are due to secondary actions. This is proved by the fact that such structures are in many cases not distributed uniformly through the whole of the crystals, but are developed from their exterior or along lines of accidental fissures which traverse them.† In such instances it is clear that the formation of the cracks must be posterior to that of the crystals which they traverse; and that the development of a structure which is determined by these lines of crack must be of later date still.‡

---

* *Quart. Journ. Geol. Soc.* Vol XLI. (1885), pp. 374–389.

† *Loc. cit.* Plates X. to XII. with description.

‡ Mr. G. H. Williams, in his very interesting paper on "The Peridotites of the Cortlandt Series," in the *American Journal of Science* for January 1886, has written under some misapprehension of the arguments of my paper. That certain enclosures in minerals are original and were formed during the growth of the crystals, I have never denied. My arguments were intended to apply to the cases of those enclosures which I have proved, by the most conclusive evidence, to be of *secondary* origin. When we find structures developed having unmistakeable relations with the accidental fissures of a crystal, it is as impossible to deny their secondary origin as it is to doubt that the serpentine found bounding the accidental cracks in a crystal of olivine was formed long subsequently to the crystallisation of the olivine itself.

From the study of all the facts exhibited in these interesting cases, I have been led to propose a theory of Schillerization which is based on certain postulates. These postulates are as follows :—

First.—If a crystal be subjected to intense strain, planes of easy solubility arise parallel to the directions along which the strain is exerted, and, in consequence of this, cavities, filled with liquids or solids, the product of the solvent action, will be formed along such planes.

Second.—In every crystal, in addition to the planes of least cohesion (cleavage-planes), and the planes along which slipping accompanied by a rotation of certain of the molecules occurs (gliding-planes), there is a third set of "structure-planes," those, namely, along which chemical action takes place most easily. These planes of chemical weakness, like the cleavage-planes and the gliding-planes, have definite relations with the symmetry of the particular system to which the crystal belongs.

Third.—Along these planes of chemical weakness, the solvent agencies working under great pressure operate in such a way as to produce cavities, which frequently take the form of negative crystals; and these may become more or less completely filled with secondary products. As solvent power is augmented by pressure, and pressure increases with the distance from the surface at which the crystal exists, the plane of greatest chemical weakness is first attacked at a certain depth, and at successively greater depths the other less pronounced planes of chemical weakness will be found to be in turn affected.

Fourth.—Although the planes of cleavage, of gliding, and of susceptibility to chemical action in a crystal are all distinct from one another, yet in most, if not in all crystals, there appear to be certain curious and very interesting relations between them.

Although I have long felt that it is impossible to account for the characteristics presented by the minerals of deep-seated rock-masses without assuming the truth of the above postulates, it is evidently most desirable to obtain experimental verifications of them. But inasmuch as our command of great pressures, and especially as our means of submitting crystals to weak chemical actions during enormous periods of time is very limited, the difficulties in the way of obtaining such experimental verifications seemed to me to be very great, if not, indeed, actually insuperable. I hope to show, however, in the present paper that very convincing evidence of the truth of all these postulates can really be adduced.

I. With respect to the production of cavities, filled with liquids or with solid decomposition products, along bands of strain, I have succeeded

in obtaining a very striking confirmation of the truth of the principle laid down. Near the gigantic fault which bounds the southern edge of the Scottish Highlands, the quartzite-pebbles of the Old-Red-Sandstone Conglomerate are found exhibiting striking evidence of the tremendous mechanical forces to which they have been subjected; sometimes one pebble is found deeply impressing another, and not unfrequently the whole of the pebbles are found to be crushed to fragments, which have been re-cemented by the deposition of secondary quartz or of calcite. In the case of a quartzite pebble which has been faulted—the mass yielding at last to the tremendous stress upon it—it occurred to me that before the pebble gave way to the force operating upon it, it must have been in a state of prolonged and violent strain along planes parallel to that in which it eventually yielded. Such being the case, if the principle which I have announced be true, we ought to find cavities filled with liquid and solid materials formed in planes parallel with that in which faulting eventually took place.

On making thin sections across such faulted pebbles, I found my anticipations to be fully realised (see Plate III. fig. 1). The quartzite is seen under the microscope to be made up of sand-grains which are portions of quartz crystals, these being cemented by secondary quartz deposited in crystallographic continuity with them, in accordance with the principle so well illustrated by Torneböhm, Sorby and Bonney. These crystalline fragments lie in every possible position, as is shown when they are viewed by polarised light, and they contain the acicular crystals of rutile and other minerals with the original liquid-cavities which distinguished the quartz of the rock from which they were derived. But running through all the grains, quite irrespectively of their orientation, we see under the microscope a series of dark lines, straight as if ruled, and showing an unmistakable parallelism with the plane along which faulting has taken place (* * in the figure). By the use of higher powers of the microscope these dark lines are resolved into bands of cavities containing liquids or with secondary infillings of solid matter. It is impossible to doubt that these bands of cavities with their fluid and solid inclusions have been produced by solvent action along the bands of strain.

II. With respect to the proposition which postulates the existence of definite planes of chemical weakness in crystals, it is manifestly difficult to obtain experimental verification in the case of the ordinary compound silicates with which the geologist has ordinarily to deal. It is probable that under the enormous pressures which exist at great depths in the earth's crust, the whole substance of such crystals is permeated by fluid and

gaseous materials capable of exercising a chemical action on the materials through which they pass. Even the methods employed with so much success by M. Daubrée could scarcely enable us to imitate the effects produced under such conditions as these. But in the case of crystals of calcite, aragonite and other minerals affected by weak solvents, it appeared to me not impossible to obtain experimental evidence of the existence of planes of chemical weakness, such as I have argued must exist in the case of the rock-forming silicates.

I had been for some time experimenting on calcite with this end in view, and not without successful results, when I found that the whole question had been dealt with in a very masterly manner by Professor Von Ebner of Gratz.*

Professor Von Ebner was led to the examination of this question from a totally different starting-point to my own. The appearances presented by certain spiculæ of calcareous sponges induced him to investigate the action of various weak solvents upon minute cleavage-fragments of calcite. A discussion of all the phenomena led him to the conclusion that there are certain planes of easy solubility which he compared to planes of least cohesion (cleavage-planes), and for these he proposes the name of solution-planes (*Lösungsflächen*). From a discussion of a great number of careful experiments he arrives at the conclusion that the primary solution-planes of calcite are parallel to $-2R$. $(\bar{1}11.)$

The very complicated phenomena of the etching figures produced on the faces and the different cleavage-planes of crystals by the action of solvents have been investigated by many observers. Since the time of Daniell, who first called attention to their importance in 1816, Leydolt, Baumhauer, Klocke, Becke and many other crystallographers have obtained a number of very valuable and suggestive results.

Professor Von Ebner discusses the whole series of remarkable forms developed by the action of solvents upon the different faces and the cleavage-planes of calcite crystals. He shows that all the diversified and complicated forms thus produced, with their curved and striated surfaces—which vary with the nature, the degree of concentration, and the temperature of the solvent, and especially with the rate at which the chemical action takes place—are capable of explanation if his view of the existence of

* Die Lösungsflächen des Kalkspathes und des Aragonites. I. Die Lösungsflächen und Lösungsgestalten des Kalkspathes (Sitzber. der Kais. Wiener Akad. der Wissensch. 89 Bd. II. Abth. 1884, pp. 368-458. II. Die Ätzfiguren des Kalkspathes. III. Die Lösungsflächen des Aragonites (Sitzber. der Kais. Wiener. Akad. der Wissensch. Bd. 91. II. Abth. (1885), pp. 760-835.

"solution-planes" be true, by the combination of and oscillation between solvent actions along different planes. He not inaptly compares the curious curved and striated figures produced by the action of acids upon calcite, to the "hardness-curves" suggested by Exner as a means of expressing the cohesive force in different parts of a crystal mass as determined by the sclerometer.

The result of Professor Von Ebner's researches is that, so far as calcite and aragonite are concerned, certain planes exist along which chemical action takes place more readily than in other directions within the crystals. It is these which Prof. Von Ebner proposes to call solution-planes (Lösungsflächen); but we must remember that the examples given are not cases of simple solution, the calcic carbonate of the crystals being actually decomposed; the circumstance which is so well illustrated by Von Ebner's experiments, that the results differ with the particular acids employed—acetic acid, formic acid, phosphoric acid or hydrochloric acid—indeed confirm the conclusion that the action ought not to be treated as one of simple solution. Perhaps, however, the name of "solution-planes," if the qualification insisted upon be borne in mind, is the simplest and most convenient that could be employed. I have already fully explained the ground for the conclusion that such solution-planes must exist in the case of many common rock-forming crystals,* and if their existence is regarded as proved in the case of the carbonates there can be no difficulty in accepting it in the case of the silicates.

III. That cavities, often taking the forms of negative crystals, make their appearance along the solution-planes of crystals, I have been able to show by some results obtained accidentally during my experiments with calcite. In Plate III. fig. 2 is represented a case where the acid eating into the calcite mass, along definite planes, has evidently given rise to forms with more or less rectilinear boundaries which clearly approximate in some cases to negative crystals.

But it is by the study of some of the more gigantic secondary enclosures of crystals—like those sometimes found in the labradorite of Labrador, and which impart to it its *avanturine* character—that we obtain the clearest evidence concerning the series of processes by which the negative crystals are eaten-out along the "solution-planes" of the crystal. By studying a series showing such structures in every stage of development, we may demonstrate the whole series of processes by which the negative crystals are formed and become filled with secondary products.

* *Quart. Journ. Geol. Soc.* Vol. XLI. (1885), p. 385.

This series of processes appears to be as follows (See Plate III. Fig. 3). :—

First.—In the clear body of the crystal scattered cavities of irregular form make their appearance. These cavities clearly lie in one or more sets of parallel planes traversing the crystal. The cavities have two flat sides, parallel to the planes in which they lie, but their peripheries are often quite irregular. Not unfrequently, however, there is a marked tendency to the assumption of rectilinear outlines, and the cavity may thus gradually pass into a negative crystal. Sometimes these irregular cavities are found more or less completely filled with brown secondary products. (Fig. 3, a, b, c.)

Second.—Not unfrequently these flat-sided and more or less irregular cavities are seen to be developed within a field which has a clear tendency to a form with rectilinear outlines. As the cavities become more and more crowded, thus encroaching upon one another, the field with scattered cavities passes into a large negative crystal. (Fig. 3, b, c, d.)

Its infilling with secondary products may take place at any stage of the development of the negative crystal; the irregular cavities may be partially or completely filled with the decomposition products before they have been made to unite by the continuation of the solvent process, or the whole negative crystal may be completely formed before the deposition of the secondary products takes place. Fig. 3, d, e, f, illustrates these different stages of development of negative cavities and their infilling by the secondary products.

Third.—As the final stage of this kind of action we get the large plates of brown material, presenting forms with rectilinear outlines. These produce the avanturine appearance, and have been frequently mistaken for crystals of foreign minerals caught up and included in the Labradorite crystal during its growth. (See Fig. 3, e, f, g.) Occasionally, as in Fig. 3 g., very characteristic forms of felspar are assumed by these negative crystals; in cases like the one figured, a measurement of the angles, as exactly as is possible with such minute bodies, shows a very close correspondence with the angles characteristic of labradorite.

It is only occasionally that we get the whole series of processes so clearly exemplified as in the example from which the drawings are taken; but no one can inspect such a series without recognising the succession of processes by which the phenomenon of "avanturism" is produced in this particular case.

It will be instructive to compare this method of the formation and infilling of negative crystals in labradorite with that previously described

as taking place in the olivines of the Island of Rum.* There is reason to believe that there is a difference in the exact *modus operandi* of the production and infilling of negative crystals in the case, not only of different mineral species, but of the same mineral under different conditions.

IV.—Bearing upon the relations between the several "structure-planes" in a crystal, we have the interesting observations of Mügge,† which seem to indicate the mutual interchangeability of the cleavage-planes and the gliding-planes. That a remarkable relation also exists between the third set of structure planes—the solution-planes—and the gliding-planes seemed to me to be indicated by my study of some of the rock-forming minerals in deep-seated masses.

Thus ordinary specimens of diallage appear to indicate that the first or easiest solution-plane in augite is parallel to the orthopinacoid, while the variety known as pseudo-hypersthene proves that the second and third solution-planes are respectively parallel to the clinopinacoid and the basal pinacoid. But Mügge has shown that augite (diopside) may be made to exhibit artificial twinning along planes parallel to the basal pinacoid.‡ The type of augite crystals first noticed in the Whin-sill by William Phillips, show that when such crystals possess the secondary lamellar twinning parallel to the basal pinacoid, these twin planes become the planes of easiest solubility in preference to the normal solution-planes. In this way we account for the interesting circumstance that the Whin-sill and similar augites exhibit a schiller structure parallel to the basal plane, and not, as in diallage, parallel to the orthopinacoid.§

My experiments with calcite have afforded me a striking proof of the conclusion that the development of secondary lamellar twinning in a crystal leads to these twin-planes becoming the planes of easiest solubility, in preference to the normal solution-planes.

A cleavage-rhomb of calcite, upon one corner of which I produced by pressure a series of twin lamellæ parallel to $-\frac{1}{2}$ R (110), was submitted to the slow action of dilute hydrochloric acid. Over the cleavage surfaces the usual curved and striated planes of the etched figures proper to those planes were produced (See Plate III. Fig. 4).

Where, however, twinning lamellæ had been produced, solvent action very readily took place along the twinning planes. When these twin-

* *Quart. Journ. Geol. Soc.* Vol. XLI. (1885), p. 382. Plate XII, Figs. 4 and 5.

† *Neues Jahrb. für Min.* 1883, I. p. 32.

‡ *Ibid.* 1886. p. 185.

§ *Quart. Journ. Geol. Soc.* Vol. XLI. (1885), p. 379.

ning planes were some distance apart, the intermediate zones of calcite showed a tendency to assume the ordinary etched figures; but where they were close together these became obscure or altogether disappeared. Hence we conclude that in a crystal of calcite where fine lamellar twinning has been produced, the twinning-planes $-\frac{1}{2}$ R (110) would be more susceptible to the solvent action than the normal solution-planes, which Von Ebner has shown to be parallel to -2 R ($\bar{1}11$).

It will be necessary, therefore, in the case of each mineral species to determine which of the solution-planes are normal ones and which are secondary ones, resulting from the previous twinning of the crystal by pressure.

I have already pointed out some of the extreme changes which may be produced in the character and appearance of a crystal by the Schillerizing process.

In some cases the development of cavities along certain planes within the crystal goes on to such an extent that the bulk of the skeleton of the crystal which is left may be less than the united bulk of the cavities which have been developed in them. This is very well seen in the plagioclase crystals in the scapolite-rock of Bamle. It is a significant circumstance that the scapolite appears to be formed at the expense of the plagioclase with its liquid cavities, which latter contain, in all probability, various soluble chlorides. MM. Fouqué and Michel-Lévy found that the scapolite and hornblende-rock, when fused, reproduced a rock made up of labradorite and pyroxene.*

I have shown that by the multiplication of minute inclusions coloured by iron oxides the whole of the felspars in a deep seated rock may acquire a brown tint, and be rendered more or less opaque.† In cases of this kind, the relation of the solution-planes to those of pre-existing lamellar-twinning is sometimes very clearly exhibited. Certain gabbros, especially those of granulitic habit, from Scandinavia, Scotland, Saxony and North America, have the minute black enclosures in their plagioclase felspars clearly arranged parallel to the Albite and Pericline twinning-planes.‡ Where either of these planes are seen by the aid of polarised light to be developed in any part of the crystals, there the enclosures appear marking them out, and where the two twin-lamellæ exist in conjunction,

* *Bull. Soc. Min. Fr.* II. (1879), p. 113.

† *Quart. Journ. Geol. Soc.* Vol. XLI. (1885). Pl. X. F. 7, pp. 376, 377.

‡ The crystals of these granulitic rocks often exhibit a peculiarity, for which I do not at present find myself able to suggest any explanation. An irregular outer zone of the rounded crystals appears to be free from the secondary inclusions which are beautifully developed in their central portions. This peculiarity is not exhibited by rocks with a granitic structure.

there the double structure is seen to be clearly marked out by the enclosures when the section is examined with high powers. That the twin-lamellæ are of later date than the crystal in which they interruptedly occur, is shown by their relations to the accidental cracks of the crystal. The exact correspondence of the bands of enclosures with the secondary twinning structure, however partially and interruptedly this may occur, shows that the former must have been produced at a later date than the latter. In such cases as these, as I have already shown, the solvent action by which the enclosures were produced, must have taken place while the crystals existed as parts of deep-seated rock-masses.

A very remarkable illustration of the relation between the secondary twinning of a crystal and the enclosures developed in it is exhibited by a crystal of felspar in a "diallage and hypersthene gabbro" from Humlebäk Scharf, Norway, as represented in Plate III., Fig. 5. Here the crystal has been bent, and on examination with polarised light, Albite twinning-planes are seen to be strongly developed in the middle part of the crystal where the flexure has been greatest, but are found to die away towards the ends where there has been no violent strain. In this central bent part of the crystal a few twin-lamellæ, corresponding to the Pericline system, are also seen crossing the former, though these too are wholly wanting at the ends where no flexure has been exerted. On examining the crystal in ordinary light with high powers, the two sets of twin-lamellæ are seen beautifully marked out by lines of cavities, some of which contain liquids, the position and degree of development of these lines of cavities exactly corresponding with those of secondary twinning.

Other interesting examples of the relation of solution-planes to the pre-existing lamellar twinning of crystals are afforded by some plagioclase-felspars which have undergone partial kaolinization. When such crystals are examined in ordinary light, two sets of lines, sometimes crossing one another nearly at right angles, can often be detected, along which the incipient decomposition has taken place. On examining the crystal with polarised light, these lines of incipient decomposition are also seen to coincide exactly with the Albite and Pericline twinning-planes of the felspar crystal, being displayed exactly in those areas of the crystals where either of these particular structures occur, and being seen to cross one another nearly at right angles in the parts where the two sets of twin-planes appear together. In this case the solvent action has taken place after the rocks have been brought near the surface by the denudation of overlying masses.

When the solvent action has gone still farther, enormous cavities, which

gradually become filled with secondary minerals, are developed along the planes of twinning, and sometimes also along the primary solution-planes of the crystal. This is admirably shown in a granulite from Arendal, Norway (Plate III. Fig. 6). Here we see a group of felspar crystals, along the solution-planes of which plates of secondary minerals have been formed, clearly marking out the original twin-structure of the felspar. Among the secondary minerals which appear to be thus formed are scapolite, wollastonite and zoisite.

As a final stage in this process of solution we find the skeleton of the original felspar crystal disappearing altogether, and the secondary product forming a pseudomorph after it. In this manner solvent action becomes an important adjunct to pressure in the transformation of the minerals of a rock from one species into another in metamorphosed rock-masses.

Explanation of Plate III.

Fig. I. represents a section of a faulted quartzite pebble from Stonehaven (see p. 83), as viewed with a magnifying power of 100 diameters. The separate sand-grains of which it is made up can be clearly distinguished, especially in polarised light. These grains of quartz contain the usual inclusions found in the quartzes of granitic rocks, such as irregular cavities with liquids and moving bubbles, acicular crystals of rutile, &c. But in addition to these, longer or shorter streams of bubbles are seen running through all the grains of quartz, quite irrespective of their orientation. Viewed with high powers, the cavities in these streams are seen to be of various sizes; they sometimes contain a liquid with moving bubble, and at other times are more or less completely filled with solid matter. The line of faulting in the pebble (* *) is clearly seen, filled up as it is with secondary calcite and quartz, and the general parallelism of these bands of cavities which run through all the grains, quite irrespectively of their optical orientation, is well marked and quite unmistakeable.

Fig. 2. Portion of a crystal of calcite which has been acted upon by very weak hydrochloric acid. The outer portion has been broken up into the solution-forms described by Von Ebner, but in the interior irregular cavities are making their appearance along certain planes, and some of these are beginning to assume the rectilinear outlines characteristic of negative crystals. The specimen is represented as seen with a magnifying power of 250 diameters. (See page 85.)

Fig. 3. Series of enclosures in a specimen of labradorite from Labrador, to illustrate the mode of development of negative crystals and

their infilling in that mineral. *a*, *b*, *c*, are magnified 100 diameters; *d*, *e*, *f*, *g*, 250 diameters. (See page 86.)

3 a. Group of irregular cavities all lying in one of the secondary solution-planes of the crystal, which in this case seems to be parallel to the basal-pinacoid (001). This appears to be determined as a solution-plane by the pre-existent lamellar "Pericline" twinning. Some of these cavities have been filled with secondary products, while others are apparently empty.

3 b. Similar group of cavities, some of which are assuming the rectilinear outlines of negative crystals. Moreover, the cavities lie within a field also bounded by rectilinear outlines.

3 c. Similar group of cavities lying within the field of a negative crystal; some of the cavities assume ramifying forms and are filled with secondary products.

3 d. Large enclosure made up of ramifying cavities, all lying parallel to the solution-plane, and terminating abruptly at the lines marking the boundary of a negative crystal. In one part, however, solution has gone farther, and the whole of this part of the negative crystal has been hollowed out. The areas in which solution has gone on are marked by the secondary deposits which have filled the spaces.

3 e. Negative crystal filled with secondary products. One half of the crystal is marked out by the ramifying cavities, similar to those shown in 3d. The other half is completely hollowed out and filled with a continuous deposit of secondary materials.

3 f. Similar negative crystals almost filled by a continuous deposit of secondary materials. While three of the sides are sharply defined by the edges of the negative crystal, the fourth side has the rugged outline so often seen in secondary inclusions, such for example as those of the hypersthene of Labrador.

3 g. Very perfect negative crystal, showing the characteristic forms of a labradorite crystal. The flat sides parallel to the solution-plane are the basal pinacoid (001), the outlines of the plate are formed by the two prism-planes (110) ($1\bar{1}0$) and the brachypinacoid (010).

This negative crystal, like the irregular spaces in the others figured, is filled with a yellowish and brownish isotropic substance. It varies greatly in depth of colour in different parts, and has none of the characters of a definite mineral species. It probably consists of hydrated silica (opal), more or less intensely coloured with the hydrated ferric oxides and other similar materials of secondary origin.

Fig. 4. Cleavage-rhomb of calcite which has been first twinned by

pressure on one of its corners, and then submitted to the action of weak hydrochloric acid. Owing to the combination and oscillation of the solvent actions along the normal solution-planes, —2 R (111), according to Von Ebner, the well-known etching figures with curved and striated surfaces have been formed on the cleavage faces. But where twinning has been produced, the secondary twin-plane —½ R (110), has become the solution-plane. In the intervals between these planes, an attempt to produce the ordinary etching figures has resulted in their partial development, but they are always cut off sharply by the new solution-planes, along which the solvent action has evidently been very energetic. The specimen is shown magnified 5 diameters. In other examples, I have succeeded in producing secondary twinning-planes so closely crowded together, that any tendency to form the ordinary etching figures seems to have been completely overcome. (See p. 87.)

Fig. 5. Section of a bent felspar-crystal in a gabbro from Humlebäk Scharf, Norway. Seen magnified 100 diameters. Following the secondary Albite and Pericline twinning-planes, cavities have been formed. Viewing the section between crossed Nicols, it is seen that not only do the lines of cavities exactly coincide in position with the twinning-planes, but that where the lamellar structure is well developed, there the cavities are largest and most abundant, while they altogether die out and disappear in the untwinned portions of the crystals. The relation of the twinning structure to the flexure of the crystal is unmistakeable. (See p. 89.)

Fig. 6. Group of felspar-crystals in a granulitic rock from Arendal, Norway. Magnified 50 diameters. More than half of these felspars has been replaced by secondary minerals. These are found to be developed in large cavities that have evidently been formed along the two great series of gliding planes in the crystals—the Albite and the Pericline systems. In addition to these, other sets of secondary inclusions, coinciding probably with the normal solution-planes, can in some cases be detected. (See p. 90.)

INDEX TO MINERALOGICAL PAPERS, &c. 1885.

By H. A. Miers, M.A.

ACTINOLITE. W. Peyton. Min. Mag. VI. p. 126. *Scotland.*
v. Modena.

ADULARIA. C. Hintze. Zs. K. x. p. 489. *Cryst.*
C. Dölter. Zs. K. xi. p. 113. *Cryst.*

AGATE. v. Modena.

ALABANDITE. C. Dölter. Zs. K. xi. p. 32. *Art.*

ALASKAITE. G. Koenig. Proc. Am. Phil. Soc. xxii. p. 211. *Chem.*

ALBERTITE. W. Morrison. Trans. Ed. Geol. Soc. v. p. 34. *Min.*

ALBITE. O. Lüdecke. Zs. K. x. p. 199. *Thuringia. Cryst.*
F. Sandberger. N. J. 1885 (1), p. 185. *Pseud. after Calcite.*

ALLACTITE. J. Krenner. Zs. K. x. p. 83. *Opt.*
H. Sjögren. Zs. K. x. p. 114. *Mon.*

ALLANITE. C. Meminger. Am. Chem. J. vii. p. 177. *Nelson Co. Chem.*

ALLUNOGEN. Baret. Bull. Soc. Min. viii. p. 440. *St Nazaire.*

AMBER. O. Helm. Schr. Ges. Danz. vi. (2), p. 234. *Mycenae.*
v. Modena.

AMBLYSTEGITE. J. Judd. Geol. Mag. ii. p. 173. *Min.*

AMPHIBOLE. F. Becke. Min. Mitth. vii. p. 93. *Twinning.*
A. Becker. Zts. Geol. Ges. Berl. xxxvii. p. 10. *Fusion exper.*

AMPHIBOLE-ANTHOPHYLLITE. G. Williams. N. J. 1885 (2), p. 175. *Baltimore.*

ANALCITE. C. Stadtländer. N. J. 1885 (2), p. 97. *Stempel. Cryst. Opt.*
A. Sauer. Zts. Geol. Ges. Berl. xxxvii. p. 453. *Pseud. after Leucite.*
S. Penfield. Am. J. Sc. xxx. p. 112. *Lake Superior.*
A. Lacroix. Bull. Soc. Min. viii. p. 357. *Opt. &c.*

ANATASE. O. Lüdecke. Zs. K. x. p. 200. *Brand. Cryst.*
G. Cesaro. Bull. Soc. Min. viii. p. 396. *Cryst.*
G. Seligmann. Ber. Nied. Ges. Bonn. 1885, p. 118. *Rutile pseud. after.*
P. Groth. Ber. Ak. Münch. 1885, p. 400. *Dauphinée.*

ANDES. G. Lallemant. An. Soc. Arg. xx. p. 123. *Min. of.*

ANDESITE. G. vom Rath. Ber. Nied. Ges. Bonn. 1885, pp. 209, 301. *Arcuentu.*
R. Maly. Ber. Ak. Wien. xci. (2), p. 65. *Trifail. Chem.*
F. Wiik. Öfv. Finsk. Vet. Förh. xxvii. p. 97. *Areskutan.*

ANGLESITE. A. Schmidt. Zs. K. x. p. 207. *Pelsöcz-Ardo.*

ANHYDRITE. A. Gorgeu. Ann. Chim. Phys. iv. p. 556. *Art.*
H. Vater. Zs. K. x. p. 390. *Cryst.*

ANORTHITE. S. Meunier. C. R. c. p. 1350. *Art.*
ANTHRACITE. M. Malagoli. Att. Soc. Nat. Mod. ii. p. 167. *Kimbote.*
A. Ferguson. J. R. As. Soc. Ceyl. ix. (2), p. 171. *Ceylon.*
ANTIMONY. G. Kunz. Am. J. Sc. xxx. p. 275. *New Brunswick.*
APATITE, &c. F. Adams. Brit. Ass. 1884, p. 717. *Canada.*
G. Brown. Brit. Ass. 1884, p. 716. *Quebec.*
F. Sandberger. N. J. 1885 (1), p. 171. *Cont. Manganese.*
T. Hunt. Min. J. liv. pp. 343, 450. *Canada;* and Can. Rec. i. p. 65.
G. Moore and V. v. Zepharovich. Zs. K. x. p. 240. *Turquois pseud. after.*
Dieulafait. Ann. Chim. Phys. v. p. 204. *Min.*
Grossouvre. Ann. d. Min. vii. p. 361. *Central France.*
G. Kinahan. Trans. Man. Geol. Soc. xviii. pp, 123, 132, *Ottawa;* and Proc. Dub. Soc. iv. p. 347.
R. Bell. Eng. Min. J. xxxix. p. 317. *Canada.*
APOPHYLLITE. F. Rinne. N. J. 1885 (2), p. 19. *Opt.*
A. Lacroix. Bull. Soc. Min. viii. p. 355. *Opt. &c.*
ARAGONITE. G. vom Rath. Ber. Nied. Ges. Bonn. 1885, p. 60. *Colorado.*
Pohlig. Ber. Nied. Ges. Bonn. 1885, p. 141. *L. Urmiah.*
E. Scacchi. Rendic. Ac. Nap. xxiv. p. 313. *Metamorphosed.*
V. v. Ebner. Ber. Ak. Wien. xci. (2), p 760. *Etching.*
v. Modena.
ARFVEDSONITE. A. Kenngott. N. J. 1885 (2), p. 165. *Chem.*
ARLBERG. H. Foullon. Jahrb. Geol. Reichs. xxxv. p. 90. *Min of.*
ARTIFICIAL MINERALS. A. Gorgeu. Ann. Chim. Phys. iv. p. 515.
I. Vogt. Bih. Vet. Ak. Hand. ix. i. *In Slags.*
ASBESTOS. vid. Modena.
ASTRAKANITE. Markownikoff. Bull. Soc. Chim. xliv. p. 383. *Chem.*
AUGITE. C. Dölter. N. J. 1885 (1), p. 43. *Opt. Chem.*
A. Knop. Zs. K. x. p. 58. *Kaiserstuhl. Chem.*
I. Vogt. Bih. Vet. Ak. Hand. ix. i. p. 4. *Art.*
AXINITE. A. Liversidge. R. Soc. N. S. W. xviii. p. 45. *N. S. Wales.*
D. Porter. R. Soc. N. S. W. xviii. p. 80. *N. S. Wales.*
P. Groth. Ber. Ak. Münch. 1885, p. 389. *Dauphinée.*

BARYTES. T. Wallace. Min. Mag. vi. p. 168. *Scotland.*
H. Foullon. Jahrb. Geol. Reichs. xxxv. p. 99. *Arlberg. Cryst.*
A. Gorgeu. Ann. Chim. Phys. iv. p. 556. *Art.*
F. Sansoni. Mem. Ac. Bol. vi. p. 471. *Vernasca. Cryst.*
C. Busz. Zs. K. x. p. 32. *Mittelagger. Cryst.*
A. Lacroix. Bull. Soc. Min. viii p. 39. *Opt.*
v. Dreelite, Modena.
BARYTO-CALCITE. E. Mallard. Bull. Soc. Min. viii. p. 44. *Cryst. Opt.*
BASTITE. v. Modena.
BAVENO. M. Francesco. Att. Soc. It. Mil. xxviii. p. 58. *Min. of.*
BEEGERITE. G. Koenig. Proc. Ac. Phil. 1885, p. 19. *San Juan Co.;* and Proc. Am. Phil. Soc. xxii. p. 211. *Chem.*

BERYL.
H. Dufet. Bull. Soc. Min. viii. p. 261. *Therm. Opt.*
R. Baker. Am. Chem. J. vii. p. 175. *Amelia Co. Chem.*
J. O'Reilly. Proc. Dub. Soc. iv. p. 505. *Glencullen.*
D. Porter. R. Soc. N. S. W. xviii. p. 78. *N. S. Wales.*
F. Wiik. Öfv. Finsk. Vet. Förh, xxviii. p. 65. *Cryst.*

BERZELIITE.
G. Flink. Nyt. Mag. xxix. p. 301. Langban.

BLENDE.
M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 36. *Silfberg.*
C. Tichborne. Proc. Dub. Soc. iv. p. 300. *Argentiferous (Kilmacooite).*
L. Sipöcz. Min. Mitth. vii. p. 285. *Hungary.*
A. v. Lasaulx. Ber. Nied. Ges. Bonn. 1885, p. 118. *Bensberg.*
Soltsien. Zts. Natwiss. Halle. iv. p. 297. *Aviles. Chem.*
v. Modena.

BORACITE.
H. Baumhauer. Zs. K. x. p. 451. *Cryst.*

BORAX.
E. Fuchs and F. Robellaz. Ann. d. Min. viii. p. 615. *California, Nevada.*

BOTRYOLITE.
A. Lacroix. C. R. ci. p. 1165. *Opt.;* and Bull. Soc. Min. viii. p. 433.

BOURNONITE.
L. Sipöcz. Min. Mitth. vii. p. 292. *Nagyag.*
C. Dölter. Zs. K. xi. p. 38. *Art.*

BOWLINGITE.
A. Lacroix. C. R. ci. p. 1165. *Opt.;* and Bull. Soc. Min. viii. p. 97.

BRAUNITE.
L. Igelström. Bull. Soc. Min. viii. p. 421. *Wermland.*
C. Rammelsberg. Ber. Ak. Berl. 1885, p. 97. *Chem.*
v. Modena.

BREWSTERITE.
A. Lacroix. Bull. Soc. Min. viii. p. 354. *Opt. &c.*

BROCHANTITE.
Atanasesco. Bull. Soc. Chim. xliii. p. 14. *Art.*

BRONZITE.
v. Modena.

BRUCITE.
A. Lösch. Verh. Russ. Min. Ges. xx. p. 318. *Ural.*
A. de Schulten. C. R. ci. p. 72. *Art.*

BURATITE.
E. Jannettaz. Bull. Soc. Min. viii. p. 43. *Chem.*

BUTTE (MONTANA).
G. vom Rath. N. J. 1885 (1), p. 158. *Min.*

BUTYRELLITE.
W. Macadam. Trans. Ed. Geol. Soc. v. p. 106. *Chem, not a min.;* and Min. Mag. vi. p. 175.

CALAMINE.
Dieulafait. C. R. c. p. 815. *Origin of.*
A. Schmidt. Zs. K. x. p. 202. *Pelsöcz-Ardo.*
M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 18. *Silfberg.*

CALCITE.
H. Foullon. Jahrb. Geol. Reichs. xxxv. p. 91. *Arlberg. Cryst.*
F. Sandberger. N. J. 1885 (1), p. 185. *Quartz and Albite pseud. after.*
F. Schalch. N. J. Beil. Bd. iv. p. 187. *Dolomite pseud. after.*
M. Weibull. Min. Mitth. vii. p. 122. *Fusibility.*
A. Wichmann. Min. Mitth. vii. p. 256. *Fusibility.*
A. v. Lasaulx. Ber. Nied. Ges. Bonn. 1885, p. 230. *Opt.*
Friedel and E. Sarasin. Bull. Soc. Min. viii. p. 304. *Art.*
F. Sansoni. Bull. Ac. Belg. ix. p. 287. *Blaton. Cryst.*

CALCITE.	F. Sansoni. Zs. K. x. p. 545. *Andreasberg. Cryst.*
	A. Schrauf. Zs. K. xi. p. 5. *Opt.*
	E. Zschau. Isis. Ber. 1884, p. 57. *Nieder-Rabenstein.*
	R. Solly. Min. Mag. vi. p. 120. *Shelve.*
	V. v. Ebner. Ber. Ak. Wien. xci. (2), p. 760. *Etching.*
	H. Foullon. Verh. Geol. Reichs. 1885, p. 148. *Deutsch-Altenberg.*
	H. Foullon. Verh. Geol. Reichs. 1885, p. 149. *Leoben.*
	F. Vogel. Pogg. xxv. p. 91. *Opt.*
	v. Modena.
CALIFORNIA.	G. vom Rath. Ber. Nied. Ges. Bonn. 1885, pp. 246, 303, 344. *Min.*
CANADA.	W. Merrit. Brit. Ass. 1884, p. 719. *Min. of.*
	R. Bell. R. Soc. Can. ii. p. 241. *Min. of N.*
CAPORCIANITE.	v. Modena.
CASSITERITE.	M. Miklucho-Maclay. N. J. 1885 (2), p. 88. *Ehrenfriedersdorf.*
	J. Collins. Min. Mag. vi. p. xi. *Virginia.*
	G. Cesaro. Bull. Soc. Min. viii. p. 102. *Cryst*
CATSEYE (QUARTZ).	A. Kenngott. N. J. 1885 (1), p. 239. *Magnetic.*
CELESTITE.	A. Caraven-Cachin. C. R. c. p. 923. *Saut.*
	A. Gorgeu. Ann. Chim. Phys. iv. p. 556. *Art.*
CERITE, &c.	W. Crookes. Chem. News, li. p. 300. *Chem.*
CERUSSITE.	A. Schmidt. Zs. K. x. p. 204. *Pelsöcz-Ardo.*
CEVENNES.	Dieulafait. C. R. c. p. 469. *Minerals of, origin.*
CHABAZITE.	A. Lacroix. Bull. Soc. Min. viii. p. 360. *Opt. &c.*
CHALCEDONY.	v. Modena.
CHINA.	C. Gardner. J. R. As. Soc. China, xix. p. 1. *Min. of, Ichang.*
CHLORITE.	A. Lacroix. Bull. Soc. Min. viii. p. 98. *Bishoptown.*
	M. Bird. Am. Chem. J. vii. p. 181. *Albemarle Co. Chem.*
	A. Cathrein. Zs. K. x. p. 445. *Pseud. after Garnet.*
CHONDROARSENITE.	E. Bertrand. Bull. Soc. Min. viii. p. 374. *Opt.*
CHONDRODITE.	C. v. Wingard. Zts. Anal. Chem. xxiv. p. 344. *Chem.*
CHRISTIANITE.	A. Lacroix. Bull. Soc. Min. viii. p. 351. *Opt. &c.*
CHROMITE.	A. Liversidge. R. Soc. N. S. W. xviii. p. 45. *N. S. Wales.*
CHRYSOTILE.	E. Smith. Am. J. Sc. xxix. p. 32. *Shipton. Chem.*
	A. Terreil. C. R. c. p. 251. *Chem.;* and Bull. Soc. Chim. xliv. p. 217.
CINNABAR.	C. Dölter. Zs. K. xi. p. 33. *Art.*
	G. Tschermak. Min. Mitth. vii. p. 361. *Nikitowka.*
CLAY.	A. Damour. Bull. Soc. Min. viii. p. 305. *Nantes. Chem.*
CLINOCHLORE.	P. Jannasch. N. J. 1885 (1), p. 92. *Chem.*
COAL.	E. Bailey. Proc. Am. Ass. 1884, p. 171. *Kansas. Chem.*
	E. Wethered. J. Mic. Soc. v. p. 406. *Structure of.;* and Proc. Cottes. Nat. 1885, p. 281.
	G. Kinahan. Proc. Dub. Soc. iv. p. 364. *Ireland.*
	H. Budden. Brit. Ass. 1884, p. 713. *Canada.*
	N. Lupton. Chem. News. lii. p. 57. *U. S. A. Chem.*
	v. Gold.

COBALTITE. J. Curie. Bull. Soc. Min. viii. p. 127. *Thermoel.*

COLEMANITE. T. Hiortdahl. Forh. Vid. Sels. Christ. 1884, 10. *Cryst. Chem.*; and Zs. K. x. p. 25. *Cryst.*

A. Arzruni. Zs. K. x. p. 272. *Cryst.*

G. v. Rath. N. J. 1885 (1), p. 77. *Cryst.*

A. Kenngott. N. J. 1885 (1), p. 241. *Chem.*

C. Bodewig and G. v. Rath. Zs. K. x. p. 179. *Mon.*

COLORADO. G. v. Rath. Verh. Nat. Ver. Rheinl. corr. bl. p. 92. *Min.*

COLUMBITE. J. Strüver. Zs. K. x. p. 85. *Piemont.*

CONNELLITE. W. Semmons. Min. Mag. vi. p. 160. *Cornwall.*

H. Miers. Min. Mag. vi. p. 167. *Cornwall.*

C. Trechmann. Min. Mag. vi. p. 171. *Cornwall.*

COPPER. v. Modena.

COPPER-GLANCE. C. Dölter. Zs. K. xi. p. 34. *Art.*

W. Jenks. Eng. Min. J. xl. p. 335. *New Mexico.*

COPPER PYRITES. B. Lotti. Boll. Com. Geol. xvi. p. 254. *Monte Catini.*

C. Dölter. Zs. K. xi. p. 35. *Art.*

B. Blount. J. Chem. Soc. 1885, p. 593. *Chem.*

CORDIERITE. E. Hussak. N. J. 1885 (2), p. 82. *In Rocks.*

CORUNDUM. A. v. Lasaulx. Zs. K. x. p 346. *Opt.*' *Cryst.*; and Ber. Nied. Ges. Bonn. 1885, p. 81.

D. Porter. R. Soc. N. S. W. xviii. p. 77. *N. S. Wales.*

A. Lacroix. Bull. Soc. Min. viii. p. 440. *Loire.*

Baret. Bull. Soc. Min. viii. p. 438. *Loire.*

v. Sapphire.

COSALITE. G. Koenig. Proc. Am. Phil. Soc. xxii. p. 211. *Chem.*

COVELLITE. C. Dölter. Zs. K. xi. p. 34. *Art.*

CROCIDOLITE. A. Kenngott. N. J. 1885 (2), p. 163. *Chem.*

CRYOLITE. H. Baumhauer. Zs. K. xi. p. 133. *Cryst.*

CRYSTALS. A. Einhorn. Proc. Roy. Soc. xxxviii. p. 65. *Math.*

G. Stokes. Nature, xxxi. p. 565, xxxii. p. 224. *Opt.*

H. Madan. Nature, xxxi. p. 83, xxxii. pp. 102, 414. *Opt.*

T. Liebisch. N. J. 1885 (1), p. 45. *Opt.*

R. Brauns. N. J. 1885 (1), p. 96. *Opt.*

W. Voigt. N. J. 1885 (1), p. 119. *Pleochroism.*

O. Mügge. N. J. 1885 (2), p. 44. *Twinning.*

T. Liebisch. N. J. 1885 (2), p. 181. *Opt.*

C. Klein. N. J. 1885 (2), p. 237. *Opt.*

V. v. Ebner. Ber. Ak. Wien, xci. (2), p. 34. *Structure of.*

H. Pitsch. Ber. Ak. Wien, xci. (2), p. 527. *Isogyric Faces.*

Koepert. Zts. Natwiss. Halle, iv. p. 140. *In Plants.*

R. Rubenson. Öfv. Vet. Ak. Förh. 1884, 10, p. 3. *Opt.*

E. Sundberg. Öfv. Vet. Ak. Förh. 1885, 5, p. 77. *Math.*

K. Koch. Ber. Nat. Ges. Freib. viii. pp. 144, 314. *Elasticity.*

E. Blasius. Zs. K. xi. p. 140. *Therm.*

L. Wulff. Zs. K. xi. p. 120. *Growth of.*

J. Beckenkamp. Zs. K. x. p. 41. *Elasticity.*

A. Schrauf. Zs. K. x. p. 261. *Opt.*

CRYSTALS. E. Blasius. Zs. K. x. p. 221. *Decomposition Figures.*
O. Lehmann. Zs. K. x. p. 321. *Microsc. Growth.*
L. Wulff. Zs. K. x. p. 374. *Growth of.*
H. Dufet. Bull. Soc. Min. viii. p. 169. *Therm. Opt.*
P. Curie. Bull. Soc. Min. viii. p. 145. *Growth of.*
E. Mallard. Bull. Soc. Min. viii. p. 452. *Twinning.*
G. Wyrouboff. Bull. Soc. Min. viii. p. 398. *Isomerism, &c.*
G Basso. Att. Ac. Tor. xx. p. 537. *Opt.;* and N. C. xviii. pp. 84, 128.
M. Bellati and R. Romanese. Att. Ist. Ven. iii. p. 653. *Transformation Heat.*
P. Curie. C. R. c. p. 1393. *Math.*
M. Websky. N. J. 1885 (1), p. 79.
J. Tutschew. Verh. Russ. Min. Ges. xx. p. 130. *Math.*
E. Fedorow. Verh. Russ. Min. Ges. xxi. *Math.*

CUMBERLAND, &c. J. Goodchild. Trans. Cumb. Ass. ix. p. 175. *Min.*

CUPRITE. H. Lewis. Proc. Ac. Phil. 1885, p. 22. *Frankford.*

DATOLITE. O. Lüdecke. Zts. Natwiss. Halle, iv. pp. 87, 276. *Cryst.;* and Zs. K. x. p. 196.
M. Malagoli. Att. Soc. Nat. Mod. ii. p. 151. *Toggiana.*
v. Modena.

DAUPHINÉE. P. Groth. Ber. Ak. München. 1885, p. 371. *Min. of.*

DESCLOIZITE. F. Genth and G. v. Rath. Proc. Am. Phil. Soc. xxii. p. 369. *Lake Valley;* and Zs. K. x. p. 464.

DESMINE. C. Bodewig. Zs. K. x. p. 276. *Chem.*

DIADELPHITE. H. Sjögren. Zs. K. x. p. 130. *Mon.*

DIALLAGE. v. Modena.

DIAMOND. A. Moulle. Ann. d. Min. vii. p. 193. *S. Africa. Min.*
D. Porter. R. Soc. N. S. W. xviii. p. 97. *N. S. Wales.*
E. Jannettaz. Bull. Soc. Min. viii. p. 42. *Cryst.*

DIASPORE. v. Modena.

DIATOMITE. W. Macadam. Chem. News, lii. p. 253. *Chem.*

DIOPSIDE. G. Flink. Öfv. Vet. Förh. 1885, 2, p. 29. *Nordmark. Mon.*
A. Streng. N. J. 1885 (1), p. 238. *Zermatt. Chem. Cryst.*
v. Augite.

DOLIANITE. A. Lacroix. Bull. Soc. Min. viii. p. 356. *Opt. &c.*

DOLOMITE. H. Foullon. Verh. Geol. Reichs. 1885, p. 402. *Carrara.*
L. Bombicci. Mem. Ac. Bol. vi. p. 307. *Cryst.*
F. Schalch. N. J. Beil. Bd. iv. p. 187. *Pseud. after Calcite.*
v. Modena.

DREELITE. A. Lacroix. Bull. Soc. Min. viii. p. 435. *Opt.* = *Barytes.*

EMERALD. W. Hidden. Am. J. Sc. xxix. p. 250. *Alexander Co.*
Laflamme. R. Soc. Can. ii. p. 231. *Saguenay.*

ENARGITE. W. Semmons. Min. Mag. vi. p. 124. *Montana.*

ENDLICHITE. F. Genth and G. v. Rath. Zs. K. x. p. 462. *Lake Valley. New Min.;* and Proc. Am. Phil. Soc. xxii. p. 367.

ENSTATITE. I. Vogt. Bih. Vet. Ak. Hand. ix. 1, p. 24. *Art.*

EPIDOTE. F. Wiik. Öfv. Finsk. Vet. Förh. xxvii. p. 76. *Pargas. Chem.*
P. Groth. Ber. Ak. Münch. 1885, p. 389. *Dauphinée.*
A. Cathrein. Zs. K. x. p. 435. *Pseud after Garnet.*
A. Dana. Zs. K. x. p. 490. *Rowe. Chem.*

EPISTILBITE. C. Bodewig. Zs. K. x. p. 276. *Chem.*
A. Lacroix. Bull. Soc. Min. viii. p. 343. *Opt. &c.*

ERUBESCITE. H. Baumhauer. Zs. K. x. p. 447. *New Mexico.*
C. Dölter. Zs. K. xi. p. 36. *Art.*

ERYTHRITE. H. Lewis. Proc. Ac. Phil. 1885, p. 120. *Phœnixville.*

ERZGEBIRGE. F. Schalch. N. J. Beil. Bd. iv. p. 178. *Min.*

EUDNOPHITE. A. Lacroix. Bull. Soc. Min. viii. p. 359. *Opt. &c.*

FAIRFIELDITE. F. Sandberger. N. J. 1885 (1), p. 185. *Rabenstein.*

FAYALITE. A. Gorgeu. Ann. Chim. Phys. iv. p. 540. *Art.*
W. Hidden. Am. J. Sc. xxix. p. 250. *Colorado.*
J. Iddings. Am. J. Sc. xxx. p. 58. *Yellowstone Park.*

FELSPAR. B. Lotti. Boll. Com. Geol. xvi. p. 57. *Cagliari.*

FELSPAR AND MICA. A. Sauer. Zts. Geol. Ges. Berl. xxxvii. p. 466. *Pseud. after Leucite.*

FICHTELITE. M. Schuster. Min. Mitth. vii. p. 88. *Salzendeich.*

FLUOR. F. Gonnard. Bull. Soc. Min. viii. pp. 9, 31. *Pontgibaud.*
F. Gonnard. Bull. Soc. Min. viii. p. 151. *Rhône.*
W. Voigt. N. J. Beil. Bd. iv. p. 228. *Elasticity.*
M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 39.
H. Dufet. Bull. Soc. Min. viii. p. 257. *Therm. Opt.*
E. Scacchi. Rendic. Ac. Nap. xxiv. p. 314. *Vesuvius.*

FRANKLINITE. F. Becke. Min. Mitth. vii. p. 224. *Etching.*

GAHNITE. A. Dana. Am. J. Sc. xxix. p. 455. *Rowe, Chem.;* and Zs. K. x. p. 490.

GALENA. M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 38. *Silfberg.*
Quiroga. An. Soc. Esp. Hist. Nat. (Act) 1885, p. 6. *Cryst.*
C. Dölter. Zs. K. xi. p. 33. *Art.*
v. Modena.

GARNET. A. Cathrein. Zs. K. x. p. 433. *Alteration of.*

GEHLENITE. I. Vogt. Bih. Vet. Ak. Handl. ix. 1, p. 123. *Art.*

GENTHITE. H. Lewis. Proc. Ac. Phil. 1885, p. 121. *Lafayette.*

GERHARDTITE. H. Wells and S. Penfield. Am. J. Sc. xxx. p. 50. *New Min.*

GISMONDITE. A. Lacroix. Bull. Soc. Min. viii. p. 364. *Opt. &c.*

GMELINITE. A. Lacroix. Bull. Soc. Min. viii. p. 363. *Opt. &c.*

GOETHITE. A. Lacroix. Bull. Soc. Min. viii. p. 41. *Chizeuil, &c.*
E. Palla. Zs. K. xi. p. 23. *Cryst.*

GOLD. A. Noguès. C. R. ci. p. 81 *Penaflor.*
R. Canaval. Jahrb. Geol. Reichs. xxxv. p. 105. *Paternion.*
E. Dunn. Geol. Mag. ii. p. 171. *Transvaal, Min.*
A. Leibus. R. Soc. N. S. W. xviii. p. 37. *Queensland.*
A. Liversidge. R. Soc. N. S. W. xviii. p. 43. *N. S. Wales.*
W. Allen. Proc. Dub. Soc. iv. p. 509. *Art.*
Laflamme. R. Soc. Can. ii. p. 227. *Beauce.*

GOLD. W. Penning. Q. J. Geol. Soc. xli. p. 569. *Transvaal.*
C. Rolker. Eng. Min. J. xl. p. 367. *Honduras.*
v. Modena.

GOLD AND COAL. E. Gilpin. Brit. Ass. 1884, p. 711. *Nova Scotia.*

GONIOMETER. T. Liebisch. N. J. 1885 (1), p. 76.

GRAPHITE. H. Putz. Ber. Nat. Ver. Pass. xiii. p. 69. *Passau.*
H. Sjögren. Min. Mag. vi. p. 151. *Cryst.*
W. Macadam. Min. Mag. vi. p. 172. *Aberdeen, Chem.*
J. Woldrich. Verh. Geol. Reichs. 1885, p. 399. *Schwarzbach.*
A. Ferguson. J. R. As. Soc. Ceyl. ix. (2), p. 171. *Ceylon.*

GRAPHITOID. A. Sauer. Zts. Geol. Ges. Berl. xxxvii. p. 441. *Erzgebirge.*

GROSSULAR. A. Gorgeu. Ann. Chim. Phys. iv. p. 553. *Art.*

GYPSUM. M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 34. *Silfberg.*
F. v. Hauer. Verh. Geol. Reichs. 1885, p. 21. *Gams.*
M. Mario. Att. Soc. Nat. Mod. ii. p. 73. *Cryst.*
E. Blasius. Zs. K. x. p. 234. *Decomposition Figures.*
G. Cesaro. Bull. Soc. Min. viii. p. 317. *Cryst.*
A. Jonquière. Mitth. Nat. Ges. Bern. 1885, p. 61. *Opt.*
v. Modena.

HÆMAFIBRITE. H. Sjögren. Zs. K. x. p. 126. *Mon.*

HÆMATITE. W. Gresley. Q. J. Geol. Soc. xli. (Proc.) p. 109. *Leicestershire.*
S. Meunier. C. R. ci. p. 889. *Art.*
H. Vater. Zs. K. x. p. 391. *Art. Cryst.*
F. Schalch. N. J. Beil. Bd. iv. p. 193. *Magnetite pseud. after.*
v. Modena.

HÆMATOLITE. v. Diadelphite.

HÆMATOSTIBIITE. L. Igelström. Bull. Soc. Min. viii. p. 143. *New Min.*

HANKSITE. W. Hidden. Am. J. Sc. xxx. p. 133. *New Min. California.*
E. Dana and S. Penfield. Am. J. Sc. xxx. p. 136. *Cryst. Chem.*

HERDERITE. A. Weisbach. N. J. 1885 (1), p. 154. *Chem.*
C. Winkler. N. J. 1885 (1), p. 172. *Chem.*
A. DesCloizeaux and A. Damour. Bull. Soc. Min. viii. p. 3. *Chem.*
F. Genth. Chem. News, li. p. 86. *Chem.*

HERSCHELITE. A. Lacroix. Bull. Soc. Min. viii. p. 362. *Opt. &c.*

HEULANDITE. A. Lacroix. Bull. Soc. Min. viii. p. 348. *Opt. &c.*
C. Bodewig. Zs. K. x. p. 276. *Chem.*

HIDDENITE. W. Hidden. Am. J. Sc. xxix. p. 250. *Alexander Co.*
T. Bouvé. Proc. Bos. Soc. xxiii. p. 2. *Gem.*

HORNBLENDE. B. Kolenko. N. J. 1885 (2), p. 90. *Pseud. after Olivine.*
G. Williams. N. J. 1885 (2), p. 175. *St. Lawrence Co.*
A. Cathrein. Zs. K. x. p. 441. *Pseud. after Garnet.*
K. Oebbeke. Bull. Soc. Min. viii. p. 52. *Mt. Dore.*

HULLITE. A. Lacroix. C. R. ci. p. 1165. *Opt.*; and Bull. Soc. Min. viii. p. 432.

HUMITE. C. v. Wingard. Zts. Anal. Chem. xxiv. p. 344. *Chem.*

HYDROCERUSSITE. A. Lacroix. Bull. Soc. Min. viii. p. 35. *Wanlockhead.*

HYDROGIOBERTITE. E. Scacchi. Rendic. Ac. Nap. xxiv. p. 310. *New Min.*

HYPERSTHENE. K. Oebbeke. Bull. Soc. Min. viii. p. 50. *Mt. Dore.*
A. Schmidt. Zs. K. x. p. 210. *Malnas.*

IDOCRASE. A. Liversidge. R. Soc. N. S. W. xviii. p. 45. *N. S. Wales.*
D. Porter. R. Soc. N. S. W. xviii. p. 80. *N. S. Wales.*

IGELSTRÖMITE. M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 19. *Silfberg* (*Iron-Knebelite*).
v. Olivine group.

ILMENITE. E. Chapman. R. Soc. Can. ii. p. 159. *Ontario.*

INDIA. V. Ball. Brit. Ass. 1884, p. 731. *Min. of.*

IODARGYRITE. F. Genth and G. v. Rath. Zs. K. x. p. 473. *Lake Valley.*

IODYRITE. F. Genth and G. v. Rath. Proc. Am. Phil. Soc. xxii. p. 375. *Lake Valley.*

IRON ORES. G. Kinahan. Proc. Dub. Soc. iv. p. 306. *Ireland.*
P. Trasenster. Rev. d. Min. xviii. p. 458. *United States.*

IRON-RHODONITE. M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 29. *New Min.*

ITACOLUMITE. G. Spezia. Att. Ac. Tor. xxi. p. 51. *Flexibility.*

JAMESONITE. C. Dölter. Zs. K. xi. p. 40. *Art.*

KAOLINITE. E. Valentine. Am. Chem. J. vii. p. 178. *Nelson Co. Chem.*

KILMACOOITE. v. Blende.

KIRWANITE. A. Lacroix. C. R. ci. p. 1164. *Opt.;* and Bull. Soc. Min. viii. p. 428.

KNEBELITE. M. Weibull. Min. Mitth. vii. p. 112. *Silfberg, Chem.*
M. Weibull. Min. Mitth. vii. p. 119. *Dannemora, Chem.*
A. Gorgeu. Ann. Chim. Phys. iv. p. 543. *Art.*
v. Olivine group.

KOBELLITE. H. F. and H. A. Kellar. J. Am. Chem. Soc. vii. p. 194. *Leadville.*

KREMS. E. Drasche. Verh. Geol. Reichs. 1885, p. 81. *New Min. from.*

KRENNERITE. L. Sipöcz. Min. Mitth. vii. p. 264. *Nagyag, Chem.*

KUSSINSK. M. Melnikow. Verh. Russ. Min. Ges. xx. p. 237. *Min. of.*

LABRADORITE. v. Modena.

LAUMONTITE. F. Schalch. N. J. Beil. Bd. iv. p. 186. *Erzgebirge.*
A. Lacroix. Bull. Soc. Min. viii. p. 339. *Opt. &c.*

LEAD ORES. M. Websky. Ber. Ak. Berl. 1885, p. 95. *Cordova, Vanadates.*

LEUCITE. C. Klein. N. J. 1885 (2), p. 234. *Cryst.*
C. Klein. N. J. Beil. Bd. iii. p. 522. *Cryst. Opt.*
H. Rosenbusch. N. J. 1885 (2), p. 59. *Cryst.*
A. Sauer. Zts. Geol. Ges. Berl. xxxvii. p. 453. *Pseud. after.*
E. Scacchi. Rendic. Ac. Nap. xxiv. p. 315. *Altered.*

LEVYNITE. A. Lacroix. Bull. Soc. Min. viii. p. 361. *Opt. &c.*

LIGNITE. v. Modena.

LIGURIA. L. Mazzuoli. Boll. Com. Geol. xvi. p. 193. *Copper Ores.*

LIMONITE. J. Welch. Chem. News, lii. p. 32. *Chem.*
v. Modena.

LINNÆITE. F. Becke. Min. Mitth. vii. p. 225. *Etching.*

LITHOMARGE. A. Liversidge. R. Soc. N. S. W. xviii. p. 45. *N. S. Wales.*

LITTAI. A. Brumlechner. Jahrb. Geol. Reichs. xxxv. p. 387. *Min. of.*

LUDWIGITE. A. Renard. Bull. Ac. Belg. ix. p. 547. *Opt.*

MAGNETITE. F. Becke. Min. Mitth. vii. p. 200. *Etching.*
M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 13. *Silfberg (Mangano-);* and Min. Mitth. vii. p. 109.
F. Schalch. N. J. Beil. Bd. iv. p. 193. *Pseud. after Hæmatite.*

MALACHITE. v. Modena.

MALACOLITE. M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 34. *Silfberg.*

MANGANESE ORES. E. Gilpin. R. Soc. Can. ii. p. 7. *Nova Scotia.*

MANGANHEDENBERGITE. M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 33. *Silfberg.*

MANGANHISINGERITE. M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 21. *Silfberg;* and Min. Mitth. vii. p. 113.

MANGANITE. C. Rammelsberg. Ber. Ak. Berl. 1885, p. 97. *Chem.*
v. Modena.

MANGANO-CALCITE. M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 14. *Silfberg;* and Min. Mitth. vii. p. 110.

MANGANO-MAGNETITE. G. Flink. Nyt. Mag. xxix. p. 303. *New Min. Langban.*
v. Magnetite.

MARCASITE. C. Dölter. Zs. K. xi. p. 31. *Art.*
v. Modena.

MARTITE. F. Schalch. N. J. Beil. Bd. iv. p. 189. *Rittersgrün.*
F. Gonnard. Bull. Soc. Min. viii. p. 308. *Cryst.*

MELILITE. I. Vogt. Bih. Vet. Ak. Hand. ix. 1, p. 105. *Art.*

MESITITE. M. Malagoli. Att. Soc. Nat. Mod. ii. p. 169. *Scandiano.*
v. Modena.

MESOTYPE. F. Gonnard. Bull. Soc. Min. viii. p. 123. *Cryst.*
A. Lacroix. Bull. Soc. Min. viii. p. 332. *Opt. &c.*

MESOLITE. A. Lacroix. Bull. Soc. Min. viii. p. 338. *Opt. &c.*

METACINNABARITE. S. Penfield. Am. J. Sc. xxix. p. 452. *Cryst.*

MIARGYRITE. C. Dölter. Zs. K. xi. p. 39. *Art.*

MICA. F. Sandberger. N. J. 1885 (1), p. 171. *With Boron.*
C. Rammelsberg. N. J. 1885 (2), p. 225. *Branchville, Chem.*
G. v. Rath. Ber. Nied. Ges. Bonn. 1885, p. 57. *Branchville.*
G. v. Rath. Ber. Nied. Ges. Bonn. 1885, p. 58. *Portland, Conn.*
A. Lacroix. Bull. Soc. Min. viii. p. 99. *Templeton.*
I. Vogt. Bih. Vet. Ak. Hand. ix. 1, p. 39. *Art.*
v. Modena.

MICROLITE. C. Hintze. Zs. K. x. p. 86. *Opt.*

MILARITE. F. Rinne. N. J. 1885 (2), p. 1. *Cryst.*

MILLERITE. G. Seligmann. Verh. Nat. Ver. Rhein. Corr. bl. p. 73. *Cryst.*

MINERALS. Erhard. Jahrb. B. H. Sachs. p. 175. *Elect.*
Dieulafait. C. R. c. pp. 469, 662, ci. pp. 324, 609, 644, 676. *Origin of.*

Minerals. A. Inostranzeff. C. R. c. p. 1396. *Microsc.*; and N. J. 1885 (2), p. 94.
J. Ady. Min. Mag. vi. p. 127. *Sections.*
E. Bertrand. Bull. Soc. Min. viii. p. 30. *Opt.*

Mineral-veins. C. Foster. Brit. Ass. 1884, p. 732.
Erhard. Jahrb. B. H. Sachs. p. 160. *Elect.*

Mispickel. P. Groth. Ber. Ak. Münch. 1885, p. 383. *Allemont.*
M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 35. *Silfberg.*

Modena. M. Malagoli. Att. Soc. Nat. Mod. ii. p. 30. *Min. of.*

Monazite. H. Gorceix. Bull. Soc. Min. viii. p. 32. *Bolivia.*
H. Gorceix. C. R. c. p. 356. *Bahia, Chem.*
H. Miers. Min. Mag. vi. p. 164. *Cornwall.*

Monimolite. G. Flink. Nyt. Mag. xxix. p. 304. *Pajsberg.*

Mont Dore. K. Oebbecke. Bull. Soc. Min. viii. p. 46. *Min.*
F. Gonnard. Bull. Soc. Min. viii. p. 310. *Min.*

Montecastelli. B. Lotti. Boll. Com. Geol. xvi. p. 82. *Copper Ores.*

Nagyagite. L. Sipöcz. Min. Mitth. vii. p. 267. *Nagyag, Chem.*

Natrolite. C. Stadtländer. N. J. 1885 (2), p. 113. *Stempel. Cryst. Opt.*

Nephrite. C. Hintze. Ber. Nied. Ges. Bonn. 1885, p. 143.
A. Kenngott. N. J. 1885 (1), p. 239. *Jordansmühl.*
H. Traube. N. J. 1885 (2), p. 91. *Jordansmühl.*
C. Bodewig. Zs. K. x. p. 86. *Tasmania.*

New Minerals. v. Endlichite, Gerhardtite, Hæmatostibiite, Hanksite, Hydrogiobertite, Iron-rhodonite, Krems, Mangano-magnetite, Polyarsenite, Selenides, Synadelphite, Uintahite.

New Mineral. H. Keller. Eng. Min. J. xl. p. 20. *Leadville.*

Niccolite. L. Sipöcz. Min. Mitth. vii. p. 281. *Dobsina, Chem.*

N. S. Wales. A. Liversidge. R. Soc. N. S. W. xviii. p. 43. *Min. of.*
D. Porter. R. Soc. N. S. W. xviii. p. 75. *Min. of.*

Okenite. A. Lacroix. Bull. Soc. Min. viii. p. 341. *Opt. &c.*

Oligoclase. A. Cathrein. Zs. K. x. p. 437. *Pseud. after Garnet.*
A. DesCloizeaux and Pisani. Bull. Soc. Min. viii. p. 6. *Opt. Chem.*

Olivine. I. Vogt. Bih. Vet. Ak. Hand. ix. 1, p. 45. *Art.*
E. Kalkowsky. Zs. K. x. p. 17. *Cryst.*
B. Kolenko. N. J. 1885 (2), p. 90. *Hornblende pseud. after.*
A. Becker. Zts. Geol. Ges. Berl. xxxvii. p. 15. *Origin of.*

Olivine Group. M. Weibull. Ofv. Vet. Ak. Förh. 1885, 2, p. 3.

Orthite. O. Lüdecke. Zs. K. x. p. 187. *Thuringia, Cryst.*

Orthoclase. V. v. Zepharovich. Ber. Ak. Wien. xci. (1), p. 158. *In Basalt*; and Zs. K. x. p. 601.
F. Gonnard. C. R. ci. p. 76. *Cryst.*; and Bull. Soc. Min. viii. p. 307.
E. Scacchi. Rendic. Ac. Nap. xxiv. p. 315. *Pseud. after Leucite.*
C. Hintze. Ber. Nied. Ges. Bonn. 1885, p. 275. *Cryst.*
v. Modena.

Ozocerite.	v. Petroleum.
Pandermite.	A. Kenngott. N. J. 1885 (1), p. 241. *Chem.*
Parisite.	G. de Grandmaison. Min. Mag. vi. p. 123. *Cryst.*
Pectolite.	A. Lacroix. Bull. Soc. Min. viii. p. 323. *Opt. &c.*
Pelsücz-Ardo.	A. Schmidt. Zs. K. x. p. 202. *Min.*
Perofskite.	A. Sauer. Zts. Geol. Ges. Berl. xxxvii. p. 445. *Wiesenthal.*
Petroleum.	J. Le Bel. Bull Soc. Colm. 1885, p. 445. *Pechelbronn.*
	v. Modena.
Petroleum & Ozocerite.	L. Cyroczynski. Rev. d. Min. xix. p. 1. *Min.*
Phacolite.	C. Bodewig. Zs. K. x. p. 276. *Chem.*
Phenacite.	W. Hidden. Am. J. Sc. xxix. p. 249. *Colorado.*
	G. Seligmann. Ber. Nied. Ges. Bonn. 1885, p. 168. *Wallis.*
Phillipsite.	C. Stadtländer. N. J. 1885 (2), p. 122. *Stempel, Cryst. Opt.*
Phosphates.	G. Hughes. Q. J. Geol. Soc. xli. p. 80. *N. S. Wales.*
Phosphorite.	O. Helm. Schr. Ges. Danz. vi. (2), p. 240. *Chem.*
	P. Thomas. C. R. ci. p. 1184. *Tunis.*
Picromerite.	O. Lüdecke. Zts. Natwiss. Halle, iv. p. 651. *Stassfurt, Cryst.*
Pinnoite.	O. Lüdecke. Zts. Natwiss. Halle, iv. p. 645. *Stassfurt, Cryst.*
Pitchblende.	v. Uraninite.
Plattnerite.	O. Lüdecke. Zts. Natwiss. Halle, iv. p. 201. *Art. Cryst.*
Plumbocalcite.	A. Lacroix. Bull. Soc. Min. viii. p. 36. *Wanlockhead.*
Polariscope.	T. Liebisch. N. J. 1885 (1), p. 175.
Polyarsenite.	L. Igelström. Bull. Soc. Min. viii. p. 369. *New Min.*
	E. Bertrand. Bull. Soc. Min. viii. p. 374. *Opt.*
Prehnite.	A. Lacroix. Bull. Soc. Min. viii. p. 326. *Opt. &c.*
	F. Schalch. N. J. Beil. Bd. iv. p. 179. *Erzebirge.*
	v. Modena.
Priceite.	A. Kenngott. N. J. 1885 (1), p. 241. *Chem.*
Proustite.	E. Rethwisch. N. J. Beil. Bd. iv. p. 31. *Mon.*
Pseudobrookite.	K. Oebbeke. Bull. Soc. Min. viii. p. 56. *Mt. Dore.*
Psilomelane.	v. Modena.
Pyrargyrite.	E. Rethwisch. N. J. Beil. Bd. iv. p. 31. *Mon.*
Pyrites.	Drinkwater. Anal. x. p. 109. *Chem.*
	M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 38.
	M. Mario. Att. Soc. Nat. Mod. ii. p. 95. *S. Ruffino.*
	A. Purgold. Isis. Ber. 1884, p. 25. *Cryst.*
	P. Groth. Ber. Ak. Münch. 1885, p. 378. *Dauphinée.*
	B. Lotti. Boll. Com. Geol. xvi. p. 254. *Montecatini.*
	L. Brugnatelli. Att. Ac. Tor. xx. p. 808. *Brosso, Cryst.*
	A. Liversidge. R. Soc. N. S. W. xviii. p. 45. *N. S. Wales.*
	J. Curie. Bull. Soc. Min. viii. p. 127. *Thermoel.*
	C. Dölter. Zs. K. xi. p. 30. *Art.*
	v. Modena.
Pyromorphite.	M. Mario. Att. Soc. Nat. Mod. ii. p. 98. *M. Galbone.*
Pyroxene.	A. Becker. Zts. Geol. Ges. Berl. xxxvii. p. 10. *Fusion Exper.*
	F. Becke. Min. Mitth. vii. p. 93. *Twinning.*
	A. Gorgeu. Ann. Chim. Phys. iv. p. 554. *Art.*
	K. de Kroustchoff. Bull. Soc. Min. viii. p. 85. *Rossberg.*

PYRRHOTITE. M. Weibull. Ofv. Vet. Ak. Förh. 1884, 9, p. 39.

QUARTZ. K. Exner. Pogg. xxv. p. 141. *Opt.*; and Ber. Ak. Wien. xci. (2), p. 218.
O. Tumlirz. Ber. Ak. Wien. xcii. (2), p. 301. *Magnetic.*
G. v. Rath. Ber. Nied. Ges. Bonn. 1885, pp. 59, 235, 301. *N. Carolina;* and Zs. K. x. pp. 156, 475.
A. v. Lasaulx. Ber. Nied. Ges. Bonn. 1885, p. 227. *Tiger's-eye.*
E. Fellenberg. Mitth. Nat. Ges. Bern. 1885, p. 99. *Bex.*
P. Groth. Ber. Ak. Münch. 1885, p. 386. *Bourg d'Oisans.*
D. Porter. R. Soc. N. S. W. xviii. p. 75. *N. S. Wales.*
S. Meunier. C. R. c. p. 1398.
J. de Lepinay. C. R. ci. p. 874. *Opt.*
H. Foullon. Verh. Geol. Reichs. 1885, p. 402. *Carrara.*
W. Frazer. Proc. Irish Ac. ii. p. 290. *Archæological.*
Quiroga. An. Soc. Esp. Hist. Nat. (Act.) p. 10. *Cryst.*
M. Weibull. Öfv. Vet. Ak. Förh. 1884, 9, p. 40.
F. Sandberger. N. J. 1885 (1), p. 185. *Pseud. after Calcite.*
W. Brown. Am. J. Sc. xxx. p. 191. *Twins.*
v. Modena.

REDRUTHITE. M. Mario. Att. Soc. Nat. Mod. ii. p. 98. *M. Galbone.*
RHABDOPHANE. G. Brush & S. Penfield. Zs. K. x. p. 82. *Connecticut.*
RHODONITE. M. Weibull. Min. Mitth. vii. p. 117. *Silfberg, Chem.*
A. Gorgeu. Ann. Chim. Phys. iv. p. 523. *Art.*
I. Vogt. Bih. Vet. Ak. Hand. ix. i. p. 37. *Art.*

RUTILE. F. Rinne. N. J. 1885 (2), p. 20. *Cryst.*
M. Miklucho-Maclay. N. J. 1885 (2), p. 88. *Ehrenfriedersdorf.*
W. Hidden. Am. J. Sc. xxix. p. 250. *Alexander Co.*
A. Lacroix. Bull. Soc. Min. viii. p. 99. *Templeton.*
G. Seligmann. Ber. Nied. Ges. Bonn. 1885, p. 118. *Pseud. after Anatase.*

SAFFLORITE. L. McCay, Am. J. Sc. xxix. p. 369. *Massive.*
SALT. O. Lüdecke. Zts. Natwiss. Halle, iv. p. 662. *Cryst.*
H. Cadell. Trans. Ed. Geol. Soc. v. p. 92. *Stassfurt.*
S. Langley. Am. J. Sc. xxx. p. 477. *Opt.*
W. Voigt. N. J. Beil. Bd. iv. p. 228. *Elasticity.*
v. Modena.

SAMARSKITE, &c. J. Smith. Chem. News, li. pp. 288, 304. *Chem.*
SAPPHIRE. V. Ball. Proc. Dub. Soc. iv. p. 393. *Himalayas.*
SARDINIA. G. v. Rath. Ber. Nied. Ges. Bonn. 1885, p. 172. *Min.*
SASSOLITE. Dieulafait. C. R. c. pp. 1017, 1240. *Origin of.*
SAUSSURITE. A. Cathrein. Zs. K. x. p. 444. *Pseud. after Garnet.*
v. Modena.

SCAPOLITE. A. Cathrein. Zs. K. x. p. 434. *Pseud. after Garnet.*
G. Tschermak. N. J. 1885 (2), p. 72. *Chem.*

Stolzite (Plumbo-). C. Hammelsberg. Ber. Ak. Berl. 1886, p. 889. *Chem.*

Stolzite. A. Liversidge. R. Soc. N. S. W. xviii. p. 44. *N. S. Wales.*

G. Flink. Nyt. Mag. xxix. p. 300. *Nordmarvi.*

Stolzite. G. Travis. Benitz. Ar. Nag. xxiv. p. 206. *Wasatch.*

C. Friedel and A. de Sarasin. Bull. Soc. Min. viii. p. 74. *Pyrol.*

Stolzite. P. Jerofejew. Verh. Russ. Min. Ges. xx. p. 186. *Ekaterinburg.*

Stolzite. v. Zepharovich.

Stolzmanite. F. Sandberger and H. Klinger. Ber. Chem. Ges. Berl. xviii. p. 2666. *Analysis.*

Stolzite. F. Sandberger. Ak. Sci. Soc. Min. Nat. Ak. p. 32. *Oxyst.*

Stolzite. L. Spirlet. Min. Mitth. vii. p. 388. *Chem.*

Stolzolite. v. Kokscharow.

Stolzolite. v. Kokscharow.

Stolzite. M. Websky. Ber. Ver. Ak. Freiz. 1884, 8. p. 70. *Min. of.*

Stolzite. M. Websky. Min. Mitth. vii. p. 115. *Chem.*, and Ber. Ver. Ak. Freiz. 1884, 3. p. 24.

Stolzite. T. Sterry. Rep. Ass. 1884, p. 479. *Chem.*

T. Sterry. Can. Nat. i. pp. 284-294. *Classification.*

L. Pisani. Am. Chem. J. vii. p. 180. *Mineral Ch. Chem.*

Stolzite, Jarg. M. Websky. Ber. Ges. Nat. Fr. Berl. 1886, p. 166. *Endeavour.*

Stolzmannite. A. Gorgeu. Ann. Chim. Phys. iv. p. 538. *Art.*

Stolzite. J. Williams. Am. J. Sc. xxxi. p. 486. *Durango.*

Stolzite. F. Becke. Min. Mitth. vii. p. 324. *Bohemia.*

A. Gorgeu. Ann. Chim. Phys. iv. p. 544. *Art.*

L. Vaga. Bih. Ves. Ak. Stanl. x. 1. p. 148. *Art.*

Stolzite. T. Brush. Proc. Bos. Soc. xxiii. p. 2. *Gem.*

Stolzite. O. Lidström. Ess. Nerwss. Hälls. iv. p. 645. *Min.*

Stolzolite. Dufrénoy. Bull. Soc. Chim. xliii. p. 437. *Chem.*

W. Prasil. Zs. K. x. p. 388. *Chem.*

Stolzite. v. Kokscharow.

Stolzite. G. v. Rath. Zs. K. x. p. 178. *Marion. Oryst.*

Stolzite. A. Lacroix. Bull. Soc. Min. viii. p. 345. *Oyst. &c.*

Stolzite. A. de Schulten. C. R. c. p. 1523. *Art.*

Stolzite. W. Vanuxem. Min. Mag. v. p. 173. *Stevenson, Chem.*

Stolzite. W. Makepeace. Am. Sci. Nat. Hist. i. p. 166. *Mysterious.*

K. Zulkrowsky. Zs. K. xi. p. 1. *Hamburg, Oryst.*

Stolzite. S. v. Prudlow. Verh. Geol. Reichs. 1886, p. 146. *Bohemia.*

v. Kokscharow.

Stolzmannite. L. Spirlet. Bull. Soc. Min. viii. p. 180. *Vermland.*

Stolzite. L. Spirlet. Min. Mitth. vii. p. 382. *Chem.*

Stolzmannite. S. Sjögren. Zs. K. x. p. 148. *Min.*

Tetr. v. Kokscharow.

Thorite. L. Vaga. Bih. Ves. Ak. Stanl. ix. 1. p. 58. *Art.*

A. Gorgeu. Ann. Chim. Phys. iv. p. 535. *Art.*

Tetragonite. T. Lovén. Zs. K. x. p. 488. *Colorado, Oryst.*

P. Jerofejew. Verh. Russ. Min. Ges. xx. p. 214. *Berezovsk.*

THENARDITE. v. Modena.
THOMSONITE. A. Lacroix. Bull. Soc. Min. viii. p. 328. *Opt. &c.*
THURINGIA. O. Lüdecke. Zs. K. x. p. 187. *Min.*
J. Clayton. Am. J. Sc. xxix. p. 454. *Loc.*
TOPAZ. F. Wiik. Öfv. Finsk. Vet. Förh. xxvii. p. 72. *Cryst.*
A. Kenngott. N. J. 1885 (1), p. 239. *Ouro Preto.*
F. Clarke and J. Diller. Am. J. Sc. xxix. p. 378. *Stoneham.*
L. Grünhut. Zs. K. x. p. 268. *Alabaschka, Cryst.*
D. Porter. R. Soc. N. S. W. xviii. p. 77. *N. S. Wales.*
C. Friedel and J. Curie. C. R. c. p. 213. *Pyroel.;* and Bull. Soc. Min. viii. p. 16.
TOURMALINE. A. Liversidge. R. Soc. N. S. W. xviii. p. 44. *N. S. Wales.*
D. Porter. R. Soc. N. S. W. xviii. p. 76. *N. S. Wales.*
TRANSCAUCASIA. L. Janet. Ane. d. Min. vii. p. 535. *Copper Minerals.*
TRIDYMITE. G. v. Rath. Zs. K. x. p. 174. *Cryst.;* and Ber. Nied. Ges. Bonn. 1885, p. 45.
TURNERITE. v. Monazite.
TURQUOIS. N. Kokscharow. Verh. Russ. Min. Ges. xx. p. 10. *Kirgis Steppe.*
G. Moore and V. v. Zepharovich. Zs. K. x. p. 240. *Pseud. after Apatite.*

UINTAHITE. W. Blake. Eng. Min. J. xl. p. 431. *New Min. Utah.*
URANINITE. C. Rammelsberg. Ber. Ak. Berl. 1885, p. 97. *Chem.*

VANADATES. v. Lead Ores.
VANADINITE. F. Genth and G. v. Rath. Zs. K. x. p. 460. *Lake Valley;* and Proc. Am. Phil. Soc. xxii. p. 365.

WAD. M. Weibull. Min. Mitth. vii. p. 111. *Silfberg, Chem.;* and Öfv. Vet. Ak. Förh. 1884, 9, p. 17.
WEHRLITE. L. Sipöcz. Min. Mitth. vii. p. 271. *Pilsen, Chem.*
WESTMORELAND. v. Cumberland.
WOLFRAM. D. Porter. R. Soc. N. S. W. xviii. p. 80. *N. S. Wales.*
L. Sipöcz. Min. Mitth. vii. p. 270. *Felsöbanya, Chem.*
WOLLASTONITE. A. Gorgeu. Ann. Chim. Phys. iv. p. 550. *Art.*
R. Breñosa. An. Soc. Esp. Hist. Nat. xiv. p. 115. *Cryst.*
I. Vogt. Bih. Vet. Ak. Hand. ix. i. p. 27. *Art.*

XENOTIME. W. Hidden. Am. J. Sc. xxix. p. 249. *Colorado.*
XONALTITE. A. Lacroix. Bull. Soc. Min. viii. p. 342. *Opt. &c.*

ZEOLITES. C. Bodewig. Zs. K. x. p. 276. *Chem.*
A. Lacroix. C. R. ci. p. 74. *Opt.;* and Bull. Soc. Min. viii. p. 321.
ZIRCON. W. Hidden. Am. J. Sc. xxix. p. 250. *Cryst.*
E. Linnemann. Ber. Ak. Wien. xci. (2), p. 1019. *Chem.*
E. Linnemann. Ber. Ak. Wien. xcii. (2), p. 427. *Opt.*
A. Purgold. Isis. Ber. 1884, p. 25. *Renfrew.*

1883 (*continued*).

ALBERTITE.	W. Morrison. Trans. Ed. Geol. Soc. iv. p. 307. *Min.*
ALBITE.	F. Wiik. Ofv. Finsk. Vet. Förh. xxv. p. 115. *Finnland.*
ALLOPHANE.	E. Smith. Am. Chem. J. v. p. 272. *Lehigh Co. Chem.*
ANDESITE.	H. Gylling. Ofv. Finsk. Vet. Förh. xxv. p. 96. *Orijärvi.*
ANORTHITE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxv. pp. 117, 122. *Finnland.*
AUGITE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxv. p. 123. *Opt.*
BISMUTH ORES.	J. Robertson. Trans. Geol. Soc. Glasg. vii. p. 126. *Australia.*
BLENDE.	v. Oest. Zts. B. H. xxxi. p. 57. *Contain Mercury.*
BRUCITE.	J. Schoenfeld and E. Smith. Am. Chem. J. v. p. 281. *Berks Co. Chem.*
CASSITERITE.	W. Blake. Eng. Min. J. xxxvi. pp. 144, 344. *Dakota.*
CHLOROPAL.	E. Smith. Am. Chem. J. v. p. 277. *Lehigh Co. Chem.*
COLUMBATES.	v. Samarskite.
CORUNDUM.	E. Smith. Am. Chem. J. v. p. 275. *Lehigh Co. Chem.*
CRYOLITE.	Johnstrup. Förh. Skand. Nat. Stock. 1880, p. 234. *Greenland.*
CRYSTALS.	R. Glazebrook. Proc. Camb. Phil. Soc. iv. p. 299. *Opt.*
CUMBERLAND, &c.	J. Goodchild. Trans. Cumb. Ass. viii. pp, 189, 214. *Min. of.*
DEWEYLITE.	D. Brunner and E. Smith. Am. Chem. J. v. p. 280. *Berks Co. Chem.*
DIAMOND.	W. Huddleston. Proc. Geol. Ass. viii. p. 65. *S. Africa, Min.*
FELSPARS.	F. Wiik. Ofv. Finsk. Vet. Förh. xxv. p. 115. *Finnland.*
FLUOR.	E. Smith. Am. Chem. J. v. p. 272. *Lehigh Co. Chem.*
GARNET.	E. Smith. Am. Chem. J. v. p. 276. *Lehigh Co. Chem.*
GOLD.	A. Schaeffer. Eng. Min. J. xxxvi. p. 34. *Texas.*
GOLD AND SILVER.	v. Oest. Zts. B. H. xxxi. p. 97. *Grafenau.*
HORNBLENDE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxv. p. 123. *Opt.*
IDOCRASE.	D. Brunner and E. Smith. Am. Chem. J. v. p. 280. *Berks Co. Chem.*
ITALY.	C. Ernst. Oest. Zts. B. H. xxxi. pp. 9, &c. *Min.*
LEPOLITE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxv. p. 120. *Finnland.*
LIGNITE.	O. Hehner. Anal. viii. p. 133. *New Zealand, Chem.*
MELANOPHLOGITE.	G. Spezia. Att. Ac. Linc. (Mem.) xv. p. 300.
MICROCLASE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxv. p. 108. *St. Gotthard.*
MINERALS.	Dieulafait. Rev. Sci. v. p. 609. *Origin of.*
PENNSYLVANIA.	D. Brunner and E. Smith. Am. Chem. J. v. p. 279. *Min. of.*
	E. Smith. Am. Chem. J. v. p. 272. *Min. of.*
PETROLEUM.	A. Okulus. Oest. Zts. B. H. xxxi. p. 485. *Hungary.*
PYROLUSITE.	E. Smith. Am. Chem. J. v. p. 277. *Lehigh Co. Chem.*
SAMARSKITE, &c.	J. Smith. Am. Chem. J. v. pp. 44, 73. *Chem.*
SILVER.	v. Oest. Zts. B. H. xxxi. p. 471. *Finnland.*
SPHENE.	D. Brunner and E. Smith. Am. Chem. J. v. p. 280. *Berks Co. Chem.*
STASSFURT.	C. Hake. J. Soc. Chem. Ind. xi. p. 146. *Min. of.*
STILBITE.	E. Smith. Am. Chem. J. v. p. 277. *Lehigh Co. Chem.*
	D. Brunner and E. Smith. Am. Chem. J. v. p. 279. *Berks Co. Chem.*
SULPHUR.	J. Russell. Eng. Min. J. xxxv. p. 31. *Utah, Nevada.*

TENORITE.	T. Egleston. Eng. Min. J. xxxv. p. 19. *Chem.*
TIN ORES.	J. Robertson. Trans. Geol. Soc. Glasg. vii. p. 126. *Australia.*
TOURMALINE.	E. Smith. Am. Chem. J. v. p. 275. *Lehigh Co. Chem.*
WAVELLITE.	E. Smith. Am. Chem. J. v. p. 273. *Lehigh Co. Chem.*
WESTMORELAND.	v. Cumberland.
ZIRCON.	E. Smith. Am. Chem. J. v. p. 273. *Lehigh Co. Chem.*

1884 (*continued*).

ALBITE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxvi. p. 141. *Pyttärlaks, Chem.*
ALUMINIC SULPHATE.	W. Brown. Am. Chem. J. vi. p. 97. *Tennessee. New Min.*
AMBER.	C. Zincken. Oest. Zts. B. H. xxxii. pp. 171, 191. *Austria, &c.*
ANDESITE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxvi. p. 143. *Aveskutan.*
ANORTHITE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxvi. p. 146. *Martensby.*
ANTHRACITE.	C. Ashburner. Eng. Min. J. xxxvii. pp. 119, 143. *Pennsylvania.*
APATITE.	W. Dawkins. Trans. Man. Geol. Soc. xviii. p. 47. *Ottawa.*
APOPHYLLITE.	E. Knerr and J. Schoenfeld. Am. Chem. J. vi. p. 413. *Chester Co. Chem.*
AUGITE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxvi. p. 147. *Opt. Chem.*
BARYTES.	F. Wiik. Öfv. Finsk. Vet. Förh. xxvi. p. 112. *Cryst.*
BREADALBANE.	J. Wilson and H. Cadell. Proc. Phys. Soc. Ed. cxiii. p. 189. *Min.*
BRUCITE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxvi. p. 154. *Ithis, Chem.*
CASSITERITE.	W. Brown. Am. Chem. J. vi. p. 185. *Rockbridge Co.*
CELESTITE.	R. Panebianco. Att. Soc. Ven. Pad. ix. p. 142. *Padua, &c.*
CHALCHIHUITES.	C. Fernandes. Naturaleza, vi. p. 303. *Min.*
CHROMITE.	J. Wilson and H. Cadell. Proc. Phys. Soc. Ed. cxiii. p. 201. *Breadalbane.*
COLUMBITE.	W. Blake. Eng. Min. J. xxxviii. pp. 362, 376. *Dakota.*
CRYSTALLOGRAPHY.	O. Liebe. Ber. Nat. Ges. Chem. 1884, p. 152.
CRYSTALS.	C. Spurge. Proc. Camb. Phil. Soc. v. p. 74. *Opt.*
DIAMOND.	C. Friedel. Bull. Soc. Chim. xli. p. 100. *Combustion.*
	H. Roscoe. Proc. Lit. Phil. Soc. Manch. xxiii. p. 5. *Min. Chem.*
ERYTHRITE.	S. Przybitek. J. Soc. Phys. Chem. Russ. xvi. p. 367. *Chem.*
GLAUCONITE.	E. Knerr and J. Schoenfeld. Am. Chem. J. vi. p. 412. *Chester Co.*
GOLD.	W. Courtis. Eng. Min. J. xxxvii. p. 478. *Montana.*
GRAPHITE.	H. Jüptner. Oest. Zts. B. H. xxxii. p. 593. *Chem.*
HAYDENITE.	H. Morse and W. Bayley. Am. Chem. J. vi. p. 24. *Chem.*
HEULANDITE.	E. Knerr and J. Schoenfeld. Am. Chem. J. vi. p. 413. *Lancaster Co.*
HORNBLENDE.	F. Wiik. Öfv. Finsk. Vet. Förh. xxvi. p. 147. *Opt. Chem.*
IRON ORES.	A. Julien. Eng. Min. J. xxxvii. p. 81. *Origin of.*

MENACCANITE.	E. Knerr and D. Brunner. Am. Chem. J. vi. p. 413. *Lancaster Co.*
MINERALS.	J. Judd. Proc. Geol. Ass. viii. p. 278. *Spec. Grav.*
MINERAL VEINS.	F. Sandberger. Eng. Min. J. xxxvii. pp. 196, 218, 232. *Origin of.*
	M. Wadsworth. Eng. Min. J. xxxvii. p. 364. *Origin of.*
NEPHRITE.	H. Traube. Leop. xx. p. 76. *Jordansmühl.*
NEW MINERALS.	v. Aluminic Sulphate, Ramisite.
ORES.	J. Newberry. Eng. Min. J. xxxviii. p. 38. *Origin of.*
OZOCERITE.	F. Smith. Am. Chem. J. vi. p. 247. *New Jersey.*
PECTOLITE.	E. Smith. Am. Chem. J. vi. p. 411. *Lehigh Co. Chem.*
QUARTZ.	M. Woulff. J. Soc. Phys. Chem. Russ. xvi. p. 140. *Elect.*
RAMISITE.	M. de Leon. Naturaleza, vii. p. 65. *New Min. Potosi.*
SPHENE.	E. Smith. Am. Chem. J. vi. p. 412. *Lehigh Co. Chem.*
STILBITE.	W. Hoskisson and D. Brunner. Am. Chem. J. vi. p. 414. *Berks Co.*
	F. Davidson. Am. Chem. J. vi. p. 414. *Berks Co. Chem.*
STRONTIANITE.	H. Jüptner. Oest. Zts. B. H. xxxii. p. 594. *Neubery, Chem.*
SULPHUR.	Maquenne. Bull. Soc. Chim. xli. p. 238. *Cryst.*
TANTALITE.	C. Schaeffer. Eng. Min. J. xxxviii. p. 285. *Dakota.*

LIST OF ABBREVIATIONS USED IN INDEX.

See also Vol. vi. pp. 142, 187, 232.

Am. Chem. J.	American Chemical Journal (Remsen). Baltimore.
Anal.	The Analyst. London.
Ant. Mad. Mag.	The Antananarivo Annual and Madagascar Magazine. Antananarivo.
Arch.Liv.Ehst.Kurl.	Archiv für die Naturkunde Liv-Ehst-und Kurlands. Dorpat.
Att. Ac. Pal.	Atti della reale Accademia di Scienze, Lettere e belle Arti di Palermo. Palermo.
Att. Soc. Ven. Pad.	Atti della Società Veneto-Trentina di Scienze naturali residente in Padova. Padova.
Att. Un. Gen.	Atti della R. Università di Genova. Genova.
Ber. Nat. Ges. Chem.	Bericht der naturwissenschaftlichen Gesellschaft zu Chemnitz. Chemnitz.
Ber. Nat. Ges. Freib.	Berichte über die Verhandlungen der naturforschenden Gesellschaft zu Freiburg i. B. Freiburg.
Ber. Nat. Ges. St. Gall.	Bericht über die Thätigkeit der St. Gallischen naturwissenschaftlichen Gesellschaft. St. Gallen.
Ber. Nat. Ver. Aug.	Bericht des naturhistorischen Vereins in Augsburg.
Ber. Nat. Ver. Pass.	Bericht des naturhistorischen Vereins in Passau.
Boll. Sci. Pav.	Bolletino Scientifico. Pavia.
Bull. Inst. Gen.	Bulletin de l'Institut National Genevois. Geneva.
Bull. Soc. Belg. Mic.	Bulletin de la Société Belge de Microscope. Bruxelles.
Bull. Soc. Chim.	Bulletin de la Société Chimique de Paris. Paris.
Bull. Soc. Murith.	Bulletin de la Société Murithienne de Valais. Neuchatel.
Bull. Soc. Nat. Colm.	Bulletin de la Société d'Histoire Naturelle de Colmar.
Bull. Soc. Neuch.	Bulletin de la Société des Sciences Naturelles de Neuchatel. Neuchatel.
Bull. Soc. Vaud.	Bulletin de la Société Vaudoise des Sciences Naturelles. Lausanne.
Can. Rec.	The Canadian Record of Science. Montreal.
Förh. Skand. Nat. Stock.	Förhandlingar vid de Skandinaviska Naturforskarnes. Stockholm.
G. Soc. Pal.	Giornale di Scienze Naturali ed Economiche pubblicato per cura della Società di Scienze di Palermo.
Jahrb. Ak. Erf.	Jahrbücher der k. Akademie gemeinnütziger Wissenschaften zu Erfurt.

JAHRB. B. H. SÄCHS.	Jahrbuch für das Berg-und Huttenwesen im Königreiche Sachsen. Freiberg.
JAHRB. PREUSS. LANDESANS.	Jahrbuch der k. preussischen geologischen Landesanstalt und Bergakademie. Berlin.
JAHRESB. NAT. GES. GRAUB.	Jahresbericht der naturforschenden Gesellschaft Graubündens. Chur.
J. AM. CHEM. SOC.	Journal of the American Chemical Society. New York.
J. R. AS. SOC. BOMB.	Journal of the Bombay Branch of the Royal Asiatic Society. Bombay.
J. R. AS. SOC. CEYL.	Journal of the Ceylon Branch of the Royal Asiatic Society. Colombo.
J. R. AS. SOC. CHINA.	Journal of the China Branch of the Royal Asiatic Society. Shanghai.
J. SOC. CHEM. IND.	Journal of the Society of Chemical Industry. Manchester.
J. SOC. PHYS. CHIM. RUSS.	Journal de la Société physico-chimique Russe. St. Petersburg.
LEOP.	Leopoldina. Halle.
MEM. AC. BARC.	Memorias de la real Academia de Ciencias naturaes y Artes de Barcelona. Barcelona.
MEM. IST. VEN.	Memorie del reale Istituto Veneto di Scienze, Lettere ed Arti. Venezia.
MEM. SOC. PHYS. GEN.	Mémoires de la Société de Physique et d'Histoire Naturelle de Genève. Geneva.
MID. NAT.	The Midland Naturalist. Birmingham.
MITTH. NAT. VER. NEU-POMM.	Mittheilungen aus dem naturwissenschaftlichen Vereine von Neu-Vorpommern und Rügen. Greifswald.
MIN. J.	The Mining Journal. London.
NAT. SIC.	Il Naturalista Siciliano. Palermo.
NATURALEZA.	La Naturaleza. Mexico.
NUOV. SAGG. AC. PAD.	Nuovi Saggi della R. Accademia di Scienze, Lettere ed Arti. Padova.
OEST. ZTS. B. H.	Oesterreichische Zeitschrift für Berg-und Huttenwesen. Wien.
ÖFV. FINSK. VET. FÖRH.	Öfversigt af Finska Vetenskaps-Societetens Förhandlingar. Helsingfors.
PROC. AM. AC.	Proceedings of the American Academy of Arts and Sciences. Boston.
PROC. GEOL. ASS.	Proceedings of the Geologists' Association. London.
PROC. PHIL. SOC. BIRM.	Proceedings of the Birmingham Philosophical Society. Birmingham.
PROC. PHYS. SOC. ED.	Proceedings of the Royal Physical Society. Edinburgh.
PROC. U. S. NAT. MUS.	Proceedings of the United States National Museum. Washington.
Q. J. GEOL. SOC.	Quarterly Journal of the Geological Society of London (and Proceedings). London.

Riv. Ac. Pad.	Rivista Periodica dei Lavori della Regia Accademia di Scienze, Lettere ed Arti. Padova.
R. Soc. Tasm.	Papers and Proceedings of the Royal Society of Tasmania. Tasmania.
Trans. As. Soc. Jap.	Transactions of the Asiatic Society of Japan. Yokohama.
Trans. Conn. Ac.	Transactions of the Connecticut Academy of Arts & Sciences. New Haven.
Trans. Cumb. Ass.	Transactions of the Cumberland & Westmoreland Association. Carlisle.
Trans. Ed. Geol. Soc.	Transactions of the Edinburgh Geological Society. Edinburgh.
Trans. Geol. Soc. Glasg.	Transactions of the Geological Society of Glasgow. Glasgow.
Trans. Irish Ac.	Transactions of the Royal Irish Academy. Dublin.
Trans. Man. Geol. Soc.	Transactions of the Manchester Geological Society. Manchester.
Trans. S. Afr. Phil. Soc.	Transactions of the S. African Philosophical Society. Cape Town.
Trud. Obsh. Est.	Trudui obshehestra Estestvoispuitatelei. Kazan.
Trud. St. Pet. Obsh. Est.	Trudui St. Petersburg obshehestra Estestvoispuitatelei. St. Petersburg.
Verh. Nat. Ver. Heid.	Verhandlungen des naturhistorischen-medicinischen Vereins zu Heidelberg.

Abstracts.

Struvite from Homburg.—E. Kalkowsky (*Zeits. f. Krystallographie*, XI. p. 1). The crystals are somewhat different in habit from those of other localities; they are here made the subject of thermo-electrical experiments, with the method devised by Prof. Kundt (*Wied. Ann.* Vol. XX.), which has already been successfully applied to quartz and boracite; in this method, as is now well-known, the crystals while cooling are dusted with a mixture of fine sulphur and red lead, which dispose themselves respectively on the antilogous and analogous poles. In the case of Struvite, it is found that the basal plane sometimes occurs at the analogous and sometimes at the antilogous end, and the same is true of the dome planes; the Homburg crystals taper towards the antilogous pole and have the basal plane at the analogous end. H. A. M.

Göthite.—E. Palla (*Ibid.* p. 23) describes a particularly well-developed Cornish crystal in which the angles could be accurately measured; the pyramid faces are slightly displaced from the positions which they should occupy on the assumption that the system is orthorhombic, and can only be referred to forms having simple indices if the crystals be regarded as belonging to the oblique system and twinned about the ortho-pinacoid; the axial angle in this case would be 90°36¼′. The optical properties closely resemble those of Brookite, the mineral being almost uniaxial for red, and having an axial angle of about 50° for blue and green light. It is not certain, therefore, whether it is to be referred to the oblique system or to the orthorhombic with vicinal planes replacing the principal pyramid planes. H. A. M.

Adularia.—A. Cathrein (*Ibid.* p. 113) describes and figures adularia from St. Gotthard with the new face $(\bar{5}06)$ $\frac{5}{6}$ P∞; from San Piero, Elba, with the new form $(1\bar{2} : 10 : 1)$ 12 P $\frac{6}{5}$; and from Schwarzenstein, Zillerthal, with the face (201) —2 P∞ which had been registered by previous observers, but rejected after careful criticism by Hessenberg. H. A. M.

P. Jannasch (*Neues Jahrbuch*, 1885 (1), p. 93), from a careful estimation of the proportion of water in clinochlore from the Mussa Alp, finds that the mineral contains 5 molecules of water and not 4 as has been hitherto supposed; of these, one molecule may be regarded as water of crystallisation, being given off over concentrated sulphuric acid at ordinary

temperatures, while the remaining 4 molecules are only lost at red heat. The composition may be represented by the formula:—4 H_2O, 5 MgO, Al_2O_3, 3 SiO_2, H_2O. H. A. M.

F. Sandberger (*Ibidem*, p. 171) finds that a number of micas contain a small and varying percentage of boric acid, although entirely free from Tourmaline microlites. The author also describes apatite occurring in pegmatite from Zwiesel which contains 3 per cent. of oxide of manganese. The name Leuco-manganite, which was given by him in 1879 to a phosphate of manganese from Rabenstein, is now withdrawn, since the mineral is found to be identical with Fairfieldite. H. A. M.

A. Kenngott (*Ibidem*, p. 241) points out that the calcium borates known under the name of Priceite, Colemanite, and Pandermite, are in all probability identical, and may be represented by the formula 4CaO, 5 B_2O_3 with a varying proportion of water. H. A. M.

A new mineral is described by Whitman Cross and L. G. Eakins under the name Ptilolite (from $\pi\tau\acute{\iota}\lambda o\nu$, *down*) in the *American Journal of Science*, Vol. XXXII. p. 117. This mineral occurs as white tufts resembling Mesolite in the pores of a vesicular Augite-Andesite, which is found in fragments in the conglomerate beds of tertiary age at Green and Table Mountains, Jefferson Co., Colorado. The tufts of Ptilolite lie on a thin coating of chalcedony which lines the pores of this rock. The composition is represented by the formula (Ca K_2 Na_2) O, Al_2O_3, 10 SiO_2, 5 H_2O, so that the mineral is more nearly allied to Stilbite than to anything else, but contains a higher percentage of silica than any known hydrated alumino-silicate. Ptilolite is gradually decomposed by strong sulphuric acid, and before the blowpipe fuses to a clear glass; under the microscope it is seen to consist of transparent hair-like prisms of which the extinction in polarised light is parallel to their axis. H. A. M.

E. S. Dana (*American Journal of Science*, XXXII. p. 314) gives a number of figures and a description of the crystals of Brookite (*Arkansite*) from Magnet Cove; these figures illustrate the striking variety of form exhibited by the Rutile from a single locality, and add a new prism face to those already observed. H. A. M.

The occurrence of Topaz and Garnet in Lithophyses of Rhyolite is described by Whitman Cross (*American Journal of Science*, XXXI. p. 432). Minute crystals of these minerals are developed in the vesicles (*Lithophyses*) of a Rhyolite at Nathrop, Colorado, and also at Chalk Mountain, Colorado, and at a point 40m. N. of Sevier Lake, Utah. The outer walls of the Lithophyses are formed of Sanidine, and with the Garnets and

Topaz which occur within them are associated minute crystals of quartz. A similar occurrence of Fayalite, from the National Yellowstone Park, was described by Iddings, so that quartz, Tridymite, Sanidine, Biotite, Augite, Topaz, Garnet, and Fayalite are the minerals now known to occur in this manner. H. A. M.

Max Bauer (*Neues Jahrbuch*, 1886 (1), p. 62) describes the pseudomorphs of Calcite after Aragonite, found at Klein-Sachsenheim in Wurtemberg. The crystals (sometimes 10 cm. long and 5 cm. thick) are deposited abundantly in large lenticular cavities in the yellow-red dolomite of the "Lettenkohle," associated with chalybite and nodules of gypsum.

The occurrence is very similar to that of pseudomorphs of Aragonite described by Sandberger from Oberwern.

The author considers that the cavities were originally filled with gypsum which had been deposited as a band in the dolomite, but of which only a trace now remains, and that as the gypsum was dissolved, crystals of Aragonite were deposited; for it appears, from Credner's researches, that the presence of gypsum in a calcareous solution may cause the carbonate to crystallise as Aragonite and not as Calcite.

It was impossible to determine with exactness the crystallographic form of the Wurtemberg crystals on account of the roughness of their faces, but they are similar to the hexagonal forms of Herrengrund, Leogang, &c.

A section of a portion of fresh limpid Aragonite cut perpendicular to the prism is seen to consist of three individuals, this treble twin-aggregation being characteristic of all the crystals. One pair of crystals seemed to be a twin about the plane $\frac{1}{3}\breve{P}\infty$ (013), so far as it could be determined by means of a paper model and a hand goniometer; but this single observation scarcely establishes a new twin law for this mineral.

The Aragonite is quite fresh in some of the crystals, whilst in others little or no trace of this species is found though the form is retained: they generally consist of Calcite surrounding a kernel of Aragonite, clearly showing that the alteration has taken place from the outside; and there are always traces of a crust of chalybite upon the crystals whether they are altered or fresh. The author considers that the band of gypsum was decomposed by water containing carbonic acid, resulting in crystals of Aragonite being formed; a thin layer of brown-spar was then deposited upon the sides of the cavities and the faces of the Aragonite crystals. When this layer had entirely coated the crystals, little or no water had entered into them, they remaining perfectly transparent and fresh; but when the protecting shell had not been so perfect, the water in the druses had dissolved away the Aragonite. The solution of carbonate of lime

being saturated, and no longer containing gypsum, was now favourable for the production of Calcite, which might further be induced by the presence of the isomorphous chalybite. The solution being in contact with the Aragonite would remain saturated, so that its decomposition would continually accompany the deposition of the Calcite.

The author considers that many so-called paramorphs may have originated in a similar way. R. H. S.

The Optical Characters of Pyroxene (*Neues Jahrbuch*, 1885 (1), p. 43). C. Doelter endeavours to trace the relation between the proportion of iron and the extinction angle in the plane of symmetry which was first indicated by Tschermak; with this object he gives the analyses and extinction angles of 22 varieties of pyroxene. From these it appears that the extinction angle increases regularly, not with the percentage of iron-oxide nor of iron oxide and alumina, but with the proportion of the iron and alumina silicates which enter into the composition of the pyroxene; in other words, the angle diminishes regularly as the proportion of the remaining silicate $CaMgSi_2O_6$ increases. Taking as abscissæ the percentage of all the silicates $CaFeSi_2O_6$, $MgFe_2SiO_6$, $MgAl_2SiO_6$, $Na_2Al_2SiO_6$, and as ordinates the extinction angle, a regular curve is obtained, whereas if the percentages of either FeO, Fe_2O_3, Al_2O_3, or all three together, are taken as abscissæ, the curve is irregular. The author finds that the curve for Diopside does not coincide with that for the alumina-augites.

H. A. M.

A New Variety of Kobellite.—(*Neues Jahrbuch*, 1886 (1), p. 79). A new sulpho-bismuthite of lead and silver is described by H. F. and H. A. Keller, from Leadville, Colorado. It is a steel-grey crystalline mineral, of metallic lustre, and with dark green to black streak, which occurs in nodules mixed with galena. Analyses lead to the formula $3\,(Pb\,Ag_2)\,S$, Bi_2S_3, the percentage of silver being between 5 and 6. H. A. M.

Review.

Lehrbuch der Mineralogie.

By Max Bauer (Berlin and Leipzig, 1886).

This excellent manual is intended for use either as a class text-book or as a guide to private study, and is admirably adapted for these purposes. While it does not aim at the fulness of detail which renders the Lehrbuch of Naumann (now edited by Prof. Zirkel) so convenient as a book of reference, it contains a large amount of information in a very readable form, and is thoroughly up to date.

As might be expected, the subjects of Crystallography and Physical Mineralogy are most fully treated; but it is unfortunate that the chemistry of the science does not receive its fair share of attention. About half of the book is devoted to the general introduction and the remainder to the description of mineral species, so that the latter occupies a smaller part of the work than is usual in text-books. In the first half crystallography and physics extend over 208 pages, while 35 pages are considered enough for mineral chemistry, including the origin and association of minerals. The optical characters (interference figures, &c.) are admirably treated, and the description of twin growth, while far from satisfactory, is more detailed than is usual.

In the second half of the book the less important minerals are only briefly described, and are distinguished from the more important by the use of a small type.

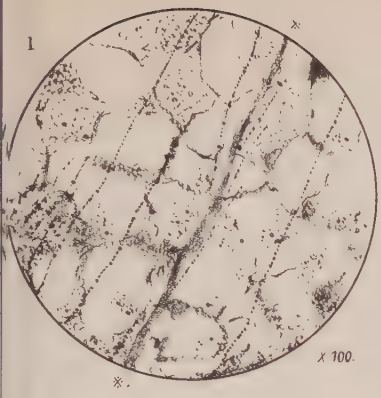
There are many good points in the book: the figures, which are for the most part new, are excellent; frequent references are given to important papers, even those of very recent date; there is a good bibliography; and the modes of occurrence and origin of minerals are ably discussed.

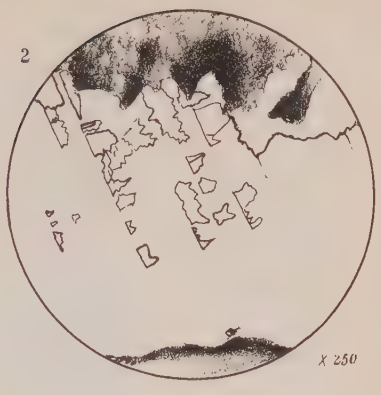
In the introductory portion the object of the author has been to describe all that is of practical importance without entering into theoretical considerations, and only those points which are illustrated by mineral substances are considered at any length.

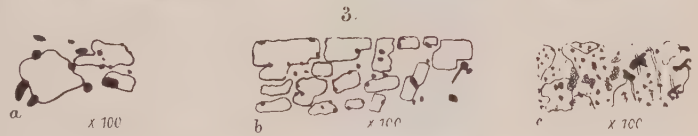
As regards the descriptive portion, exception may be taken by many readers to the classification adopted, which is somewhat unusual (Borates, Carbonates, Titanates, Silicates, Tantalates, Phosphates, Wolframates, Chromates, Sulphates); while within each class an attempt is made to

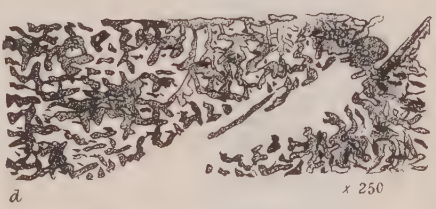
arrange the species in the order of increasing basicity, the hydrated compounds being separated from the anhydrous. In this part of the book, as in the introduction, the chemical properties do not receive the attention which they deserve.

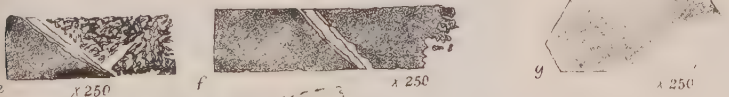
We notice that in the list of minerals, which professes to be complete, Connellite is conspicuous by its absence, as indeed is the case in almost all German text-books; Astrophyllite is retained with the mica group, though now generally regarded as a Pyroxene; such small points, and the many misprints which unfortunately disfigure the book, will, it may be hoped, be corrected in a second edition, which will doubtless be soon required. The book is an excellent manual, and may be heartily recommended.









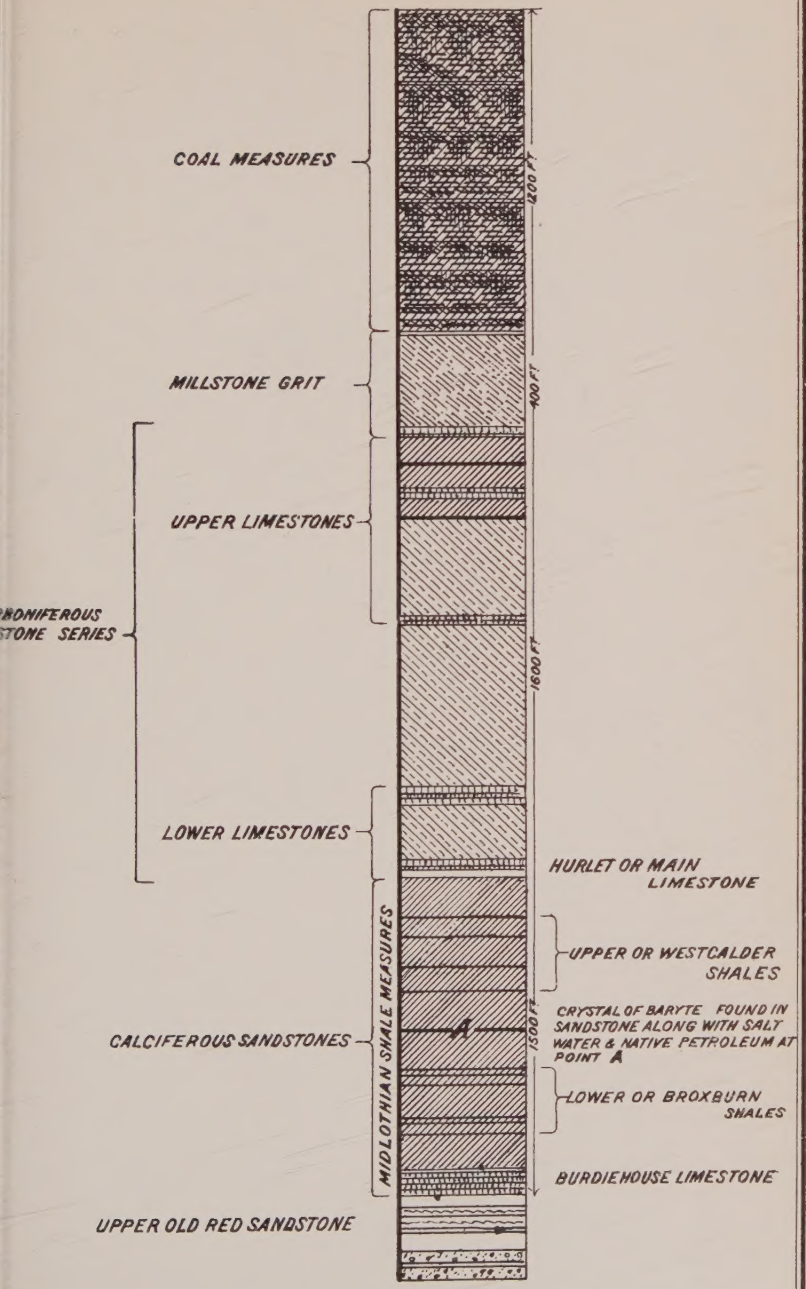


Mintern Bros. imp.

ker & Coward del et lith.

Illustrations of Schillerization.

GENERAL SECTION OF STRATA MIDLOTHIAN.



To illustrate Dr. Trechmann's Paper.

The Mineralogical Society forwards its publications to the following Societies, Public Bodies, and Editors:

GREAT BRITAIN & IRELAND.

Dublin.	Royal Irish Academy ..	19 Dawson Street.
Cambridge.	The Mineralogical Museum.	
Edinburgh.	Royal Society.	
Glasgow.	University.	
	Geological Society.	207 Bath Street.
London.	Athenæum	22 Took's Court, Cursitor Street, W.C.
	Academy	27 Chancery Lane, W.C.
	Chemical News	Boy Court, Ludgate Hill, E.C.
	Chemical Society	Burlington House.
	Colliery Guardian	49 Essex Street, W.C.
	English Mechanic	332 Strand, W.C.
	Geological Magazine	Trübner & Co., 57 Ludgate Hill, E.C.
	Geological Society	Burlington House
	The Keeper of Mining Records	28 Jermyn Street, S.W.
	Mining Journal	26 Fleet Street, E.C.
	Monthly Journal of Science.	3 Horseshoe Court, Ludgate Hill, E.C.
	Museum of Practical Geology	28 Jermyn Street, S.W.
	Nature	29 & 30 Bedford Street, W.C.
	Royal Microscopical Society	King's College, Strand, W.C.
	Royal Society	Burlington House.
Leeds.	Yorkshire Naturalists' Union	W. D. Roebuck, Sunny Bank.
	Leeds Naturalists' Club ..	Municipal Buildings, Leeds.
Newcastle-upon-Tyne.	North of England Institute of Mining Engineers.	

EUROPE.

Helsingfors.	Administration des Mines.
Liége.	Société Géologique de Belgique.
Luxembourg.	Société des Sciences.
Paris.	Société Minéralogique de France.
Pisa.	Società Toscana di Scienze Naturali.
Rome.	Ufficio Geologico, S. Susanna.
Bonn.	Zeitschrift für Krystallographie und Mineralogie, Dr. C. Hintze, Lennestrasse 37.
Vienna.	K. K. Geologische Reichsanstalt.
	Mineralogische und Petrologische Mittheilungen.

AMERICA.

Baltimore, Maryland.	The Johns Hopkins University (Publication Agency).
Buenos Ayres.	Sociedad Cientifica Argentina.
New Brunswick.	Department of Mines, Nova Scotia.
Newhaven (Conn.)	American Journal of Science and Art.
Philadelphia.	Academy of Sciences.
Washington.	Smithsonian Institution (Agent, Wesley & Co., 28 Essex Street, W.C.)
	U.S. Geological Survey, Department of Interior.

AUSTRALASIA.

Sydney.	Technological Museum.
	Royal Society of New South Wales.
Wellington, N.Z.	New Zealand Institute.

CONTENTS OF No. 33.

		PAGE
Trechmann.	Barytes from Addiewell, West Calder, in Midlothian	49
Solly.	Francolite, a Variety of Apatite from Levant Mine, St. Just, Cornwall	57
Robinson.	Two Analyses of Crystals of Apatite	59
Solly.	Anglesite from Portugal	61
Kinch.	On Plattnerite	63
Kinch & Butler.	On a New Variety of Mineral from Cornwall	65
Miers.	Note on the Crystallographical Characters	70
Hampton.	Cassiterite of the Straits Settlements	71
Macadam.	On the Occurrence of considerable Deposits of Limonite (Bog Iron Ore) in North-west Ross-shire	72
	Further Note on Agalmatolite in Gairloch Parish, Ross-shire	74
	On the Analysis of a Sample of Talc used in Paper-making	75
	Analyses of China Clay (Kaolinite), Cornwall	76
Honeyman.	Note on the Identification of the Scotch and New Brunswick "Albertites"	77
Butler.	Note on Schorlaceous Rocks from near St. Austell	79
Judd.	On the Relations between the Solution-planes of Crystals and those of Secondary Twinning; and on the Mode of Development of Negative Crystals along the former. A Contribution to the Theory of Schillerization	81
Miers.	Index to Mineralogical Papers, &c., 1885	93
	Abstracts and Review	114

CONTENTS OF No. 32.

Bonney.	On a Glaucophane-eclogite from the Val d' Aoste	1
Lewis.	On Idocrase and other Minerals recently found near Zermatt	9
Miers.	Orthoclase from Kilima-njaro, and Adularia from Switzerland	10
Taylor.	On the Nomenclature of the Hydrocarbon Compounds, with a suggestion for a new classification	13
Kerr.	The Metallic Ores of Chili	18
Bell.	New Localities for the Mineral Agalmatolite, with Notes on its Composition	24
Macadam.	On a New Locality for Agalmatolite	29
Macadam.	On some New Localities for the Mineral Diatomite, with Notes on the Chemical Composition of the Specimens exhibited	30
Wilson & Macadam.	Diatomaceous Deposits in Skye	35
Macadam.	On the Chemical Composition of the Mineral Bruiachite, found by Mr. Thomas D. Wallace, of Inverness, at Loch Bhruithaich, Inverness-shire	42
	Abstracts	43

ORIGINALLY PRINTED IN GREAT BRITAIN BY MESSRS. WILLIAMS AND STRAHAN, LONDON. REPRINTED OFFSET LITHO BY BIDDLES LTD., THE CITY PRESS, GUILDFORD, SURREY.